DOCUMENT RESUME

ED 301 658	CE 051 353
TITLE	National Conference on Critical Issues in Competency-Based Testing for Vocational-Technical Education (Nashville, Tennessee, April 11-13, 1988). Conference Notebook.
INSTITUTION	Vocational Technical Education Consortium of States, Decatur, GA.
PUB DATE	Apr 88
NOTE	279p.
PUB TYPE	Collected Works - Conference Proceedings (021) -- Reports - Research/Technical (143)
EDRS PRICE	MF01/PC12 Plus Postage.
DESCRIPTORS	*Competency Based Education; Computer Oriented Programs; *Criterion Referenced Tests; Databases; Field Tests; *Legal Responsibility; Occupational Tests; Postsecondary Education; Scores; Secondary Education; Task Analysis; Technical Education; *Test Construction; Test Items; *Test Validity; *Vocational Education
IDENTIFIERS	Florida; Oklahoma; Pennsylvania

ABSTRACT

This notebook contains the following conference presentations: "Identifying and Validating Task Lists by Business and Industry for Test/Test Item Development" (Charles Losh); "Conducting a Task Analysis for Competency-Based Test Item Development" (Brenda Hattaway); "Writing and Reviewing Test Items: Multiple Choice, Matching, Performance" (Ora Kromhout); "Managing the Development of a Computerized Test Item Bank" (Fred Reneau); "Field Testing Strategies" (Barbara Hinton); "Managing Test Results: Scoring, Reporting Results, and Interpreting Data" (Chris Olson); "Legal Issues concerning Competency-Based Testing" (Thomas H. Fisher); "Occupational Testing--What We Do in Oklahoma" (Brenda Stacy); "Pennsylvania Skills Certificate" (Bill Reilly); "Florida's Testing Program" (Warren Harrell); "V-TECS Test Item Banks" (Brenda Hattaway, Ron McCage); and "Constructing a Competency-Based Test" (John Horton). The conference agenda, a description of the conference sessions, information about the presenters, and the conference evaluation survey form are included. (MN)

****
*   Reproductions supplied by EDRS are the best that can be made   *
*   from the original document.   *
****

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it

☐ Minor changes have been made to improve reproduction quality

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

B Hattaway

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Table of Contents

Agenda 1

Description of Sessions
About the Presenters 2

Conference Survey 3

Identifying and Validating Task Lists by Business & Industry for Test/Test Item Development 4

Conducting a Task Analysis for Competency-Based Test Item Development 5

Writing and Reviewing Test Items: Multiple Choice, Matching, Performance 6

Managing the Development of a Computerized Test Item Bank 7

Field Testing Strategies 8

Managing Test Results: Scoring, Reporting Results, and Interpreting Data 9

Legal Issues Concerning Competency-Based Testing 10

Occupational Testing -- What We Do In Oklahoma 11

Pennsylvania Skills Certificate 12

Florida's Testing Program 13

V-TECS Test Item Banks 14

Constructing a Competency-Based Test 15

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

PLEASE NOTE---

- Be sure to complete the **CONFERENCE SURVEY** (Section 3) before you leave. You may give it to any **V-TECS** staff member.

- It is recommended that you attend the sessions listed below in the sequence indicated, particularly if you are just beginning to be involved in competency-based testing.

    1. Identifying and Validating Task Lists by Business & Industry for Test/Test Item Development
    2. Conducting A Task Analysis for Competency-Based Test Item Development
    3. Writing and Reviewing Test Items: Multiple Choice, Matching, Performance

- Meeting rooms for the Conference:

The Galleria Level
Knoxville A & B

The Exhibit Level
Judges Parlour

The Mezzanine Level
Cherokee
Natchez Trace
Belle Meade

- Special thanks to the following organizations for sponsoring the reception on Monday:

Career Success Magazine

Educational Data Systems, Inc.

Mid-America Vocational Curriculum Consortium

National Occupational Competency Testing Institute

Piney Mountain Press, Inc.

Vo-Tech Data Systems, Inc.

THANK YOU FOR NOT SMOKING DURING SESSIONS

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

AGENDA: Monday, April 11

TIME	ACTIVITY	LOCATION
8:00 - 12:30	Registration and Refreshments	Belle Meade Foyer
9:30 - 10:00	Welcome Marvin Flatt, State Director, Tennessee Anne Matthews, Chairman of the Board, V-TECS Ron McCage, Director, V-TECS	Belle Meade
10:00 - 11:00	Keynote Address: "Why is Competency-Based Testing Critical to Vocational Education?" Barry Ballard, State Director, Arkansas Addison Hobbs, State Director, Maryland	Belle Meade
11:00 - 11:15	BREAK	
11:15 - 12:30	Panel Discussion: "Approaches to Competency-Based Testing" Moderator: Anne Matthews, South Carolina Panelists: Dick Grover, Georgia Bill Reilly, Pennsylvania Brenda Stacy, Oklahoma	Belle Meade
12:30 - 2:00	LUNCH (on your own)	
2:00 - 3:00	Legal Issues Concerning Competency-Based Testing Thomas Fisher, Director, Student Assessment, Florida	Belle Meade
4:00 - 6:00	Vendor Carousel and Vendor Sponsored Reception You are invited to enjoy the hospitality provided by the following organizations as you learn more about their products and services: CAREER SUCCESS MAGAZINE EDUCATIONAL DATA SYSTEMS, INC. MID-AMERICA VOCATIONAL CURRICULUM CONSORTIUM NATIONAL OCCUPATIONAL COMPETENCY TESTING INSTITUTE PINEY MOUNTAIN PRESS VO-TECH DATA SYSTEMS VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES Three carousel rounds are scheduled as follows: 4:00 - 4:30 4:45 - 5:15 5:30 - 6:00 Attend the presentations of your choice. The exhibits will be open from 3:00 - 7:00 so that you may visit all the organizations.	Knoxville A & B

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

AGENDA: Tuesday, April 12 (MORNING)

TIME	ACTIVITY	LOCATION
8:00 - 12:00	Registration	Commodore Foyer
8:30 - 9:30	Concurrent Sessions	
	Identifying and Validating Task Lists by Business & Industry for Test/Test Item Development Charles Losh, Utah	Cherokee
	Conducting a Task Analysis for Competency-Based Test Item Development Brenda Hattaway, V-TECS	Judges Parlour
	Writing and Reviewing Test Items: Multiple Choice, Matching, Performance Ora Kromhout, Florida	Natchez Trace
	Managing the Development of a Computerized Test Item Bank Fred Reneau, Illinois	Knoxville B
9:30 - 10:00	BREAK with Refreshments	
10:00 - 11:00	Concurrent Sessions	
	Identifying and Validating Task Lists by Business & Industry for Test/Test Item Development Charles Losh, Utah	Cherokee
	Conducting a Task Analysis for Competency-Based Test Item Development Brenda Hattaway, V-TECS	Judges Parlour
	Managing Test Results: Scoring, Reporting Results, and Interpreting Data Chris Olson, Michigan	Natchez Trace
	Managing the Development of a Computerized Test Item Bank Fred Reneau, Illinois	Knoxville B
11:15 - 12:15	Concurrent Sessions	
	Identifying and Validating Task Lists by Business & Industry for Test/Test Item Development Charles Losh, Utah	Cherokee
	Conducting a Task Analysis for Competency-Based Test Item Development Brenda Hattaway, V-TECS	Judges Parlour
	Writing and Reviewing Test Items: Multiple Choice, Matching, Performance Ora Kromhout, Florida	Natchez Trace
	Managing the Development of a Computerized Test Item Bank Fred Reneau, Illinois	Knoxville B

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

AGENDA: Tuesday, April 12 (AFTERNOON)

TIME	ACTIVITY	LOCATION
12:15 - 2:00	LUNCH (On your own)	
2:00 - 3:00	Concurrent Sessions	
	Statistical Analyses for Criterion-Referenced Test Items Richard Erickson, Missouri	Cherokee
	Constructing a Competency-Based Test John Horton, Kentucky	Natchez Trace
	Field Testing Strategies Barbara Hinton, Arkansas	Knoxville B
	Managing Test Results: Scoring, Reporting Results, and Interpreting Data Chris Olson, Michigan	Judges Parlour
3:00 - 3:30	BREAK with Refreshments	
3:30 - 4:30	Concurrent Sessions	
	Statistical Analyses for Criterion-Referenced Test Items Richard Erickson, Missouri	Cherokee
	Constructing a Competency-Based Test John Horton, Kentucky	Natchez Trace
	Field Testing Strategies Barbara Hinton, Arkansas	Knoxville B
	Managing Test Results: Scoring, Reporting Results, and Interpreting Data Chris Olson, Michigan	Judges Parlour

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

AGENDA: Wednesday, April 13

TIME	ACTIVITY	LOCATION
8:30 - 9:30	Concurrent Sessions	
	Writing and Reviewing Test Items: Multiple Choice, Matching, Performance Ora Kromhout, Florida	Cherokee
	Constructing a Competency-Based Test John Horton, Kentucky	Natchez Trace
	Field Testing Strategies Barbara Hinton, Arkansas	Judges Parlour
9:45 - 11:45	Carousel Session (Refreshments will be served during the Carousel)	Knoxville A & B
	Three carousel rounds are scheduled as follows: 9:45 - 10:15 10:30 - 11:00 11:15 - 11:45	
	Choose from these presentations:	
	Florida's Testing Program Warren Harrell	
	Applied Test Item Banking - Georgia Dick Grover	
	Accessing the Michigan Test Item Bank: On-Line Demonstration Chris Olson	
	National Occupational Competency Testing Institute Allan Chrenka	
	North Carolina VoCATS Meg Murphy Myrtle Stogner	
	Occupational Testing -- What We Do In Oklahoma Brenda Stacy	
	Pennsylvania Skills Certificate Bill Reilly	
	IDECC - MARKED Beth Osteen	
12:00 - 1:00	Closing Session Anne Matthews Ron McCage	Knoxville A & B

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Session Summary

Session	Day	Time
Opening Session	Monday	9:30 - 10:00
Keynote Address: "Why is Competency Based Testing Critical to Vocational Education?"	Monday	10:00 - 11:00
Panel Discussion: Approaches to Competency-Based Testing	Monday	11:15 - 12:30
Identifying and Validating Task Lists by Business & Industry for Test/Test Item Development	Tuesday	8:30 - 9:30 10:00 - 11:00 11:15 - 12:15
Legal Issues Concerning Competency-Based Testing	Monday	2:00 - 3:00
Exhibits Open	Monday	3:00 - 7:00
Vendor Carousel/Hospitality	Monday	4:00 - 6:00
Conducting a Task Analysis for Competency-Based Test Item Development	Tuesday	8:30 - 9:30 10:00 - 11:00 11:15 - 12:15
Writing and Reviewing Test Items: Multiple Choice, Matching, Performance	Tuesday	8:30 - 9:30 11:15 - 12:15
	Wednesday	8:30 - 9:30
Managing the Development of a Computerized Test Item Bank	Tuesday	8:30 - 9:30 10:00 - 11:00 11:15 - 12:15
Managing Test Results: Scoring, Reporting Results, and Interpreting Data	Tuesday	10:00 - 11:00 2:00 - 3:00 3:30 - 4:30
Statistical Analyses for Criterion-Referenced Test Items	Tuesday	2:00 - 3:00 3:30 - 4:30
Constructing a Competency-Based Test	Tuesday	2:00 - 3:00 3:30 - 4:30
	Wednesday	8:30 - 9:30
Field Testing Strategies	Tuesday	2:00 - 3:00 3:30 - 4:30
	Wednesday	8:30 - 9:30
Carousel Session	Wednesday	9:45 - 11:45
Closing Session	Wednesday	12:15 - 1:00

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

SCHEDULE PLANNER

	1st Choice	2nd Choice
MONDAY		
4:00 pm - 4:30 pm		
4:45 pm - 5:15 pm		
5:30 pm - 6:00 pm		
TUESDAY		
8:30 am - 9:30 am		
10:00 am - 11:00 am		
11:15 am - 12:15 pm		
2:00 pm - 3:00 pm		
3:30 pm - 4:30 pm		
WEDNESDAY		
8:30 am - 9:30 am		
9:45 am - 10:15 am		
10:30 am - 11:00 am		
11:15 am - 11:45 am		

NOTES:

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Description of Sessions

PANEL DISCUSSION: "APPROACHES TO COMPETENCY-BASED TESTING"

Dick Grover, Georgia

The presentation will focus on Georgia's model of using state developed item banks for classroom testing. Topics will include:

test item development,
item coding,
software delivery systems, and
state level management.

William J. Reilly, Pennsylvania

In September of 1986, the Pennsylvania Department of Education created competency testing program to be known as "The Pennsylvania Skills Certificate Program." The program, to recognize high achievement by vocational education students, has become a joint venture with the National Occupational Competency Testing Institute (NOCTI). Forty (40) new Student Occupational Competency Achievement Tests (SOCATSs) were developed in addition to the thirty (30) that already existed in the SOCAT battery. By spring of 1987-88, the goal is to offer the opportunity for students completing secondary vocational education program in Pennsylvania to take the test and qualify for recognition under the "Pennsylvania Skills Certificate." All students completing the test will receive a SOCAT certificate and work credential. This conference session will discuss the broad of concept of the approach being taken in Pennsylvania.

Brenda Stacy, Oklahoma

This presentation will provide an overview of the Test Development Process followed in Oklahoma. The unique features of this system will be emphasized.

CONCURRENT SESSIONS

Conducting a Task Analysis for Competency-Based Test Item Development

Brenda Hattaway

This session will deal with a critical step in the item development process: task analysis. The presentation will cover the steps in conducting a task analysis which results in the identification of:

- performance standards
- major steps followed by a worker performing the task
- knowledge and skills needed to perform the task
- necessary tools, materials, and equipment
- attitudes, employability skills and safety practices related to the task

Constructing a Competency-Based Test

John Horton

An in-depth look at how to put a test together so that you know you're testing what you're supposed to be testing. Includes ideas for developing test items as well as a system for assuring that the test adequately covers the program to be tested. Methods for constructing written as well as performance tests will be presented.

Field Testing Strategies

Barbara Hinton

This session will address strategies for implementing a test item bank for state-wide testing. Consideration will be given to procedures for cross-walking test items to state-specific course content guides, test generation procedures, and test results analysis and reporting. Discussion will include suggestions on what does and does not work when field testing items on a state-wide basis.

Identifying and Validating Task Lists by Business & Industry for Test/Test Item Development

Charles Losh

The topic of this presentation is "how to" obtain, synthesize and validate task lists for competency-based test/test item development.

A CBVE program and competency-based test bank is only as good as the base of development. Participants will be provided with a specific process that has been and is successfully used in validating task lists using occupation specific advisory committees. The use of existing resources will be emphasized and specific interaction techniques will be shared.

Managing Test Results: Scoring, Reporting Results, and Interpreting Data

Chris Olson

The presenter will discuss how criterion-referenced tests are developed, scored, the results reported, and the data interpreted for the summative evaluation of students and the formative evaluation of the test and curriculum as currently done in Michigan. Examples of tests and results packages will be distributed and discussed.

Managing the Development of a Computerized Test Item Bank

Fred Reneau

The development of test items is enhanced by the utilization of a computer system. The task analysis is a critical step in the identification of test items. A brief overview of the procedures followed in the development of test items will be discussed. A demonstration using a microcomputer and an integrated software program will be used to illustrate the ease of manipulation in the development of test items. Test manipulation will include entry, editing, sorting, electronic transferring, storing and print format output.

Statistical Analyses for Criterion-Referenced Test Items

Richard C. Erickson

Norm-referenced and criterion-referenced testing will be compared and contrasted. Classical test theory and statistical analyses for norm-referenced testing will be reviewed along with the problems inherent in applying these analyses to criterion-referenced testing. Several statistical techniques designed for criterion-referenced test item analysis will be presented as means for assessing item difficulty, validity, reliability as well as the ability of an item to discriminate between those who have and those who have not met a stated criterion. Recent developments in item analysis based upon item response theory and their implications for development and analyses for criterion-referenced test item banking will be touched upon. The presentation will close on a discussion of analyses for item banks to serve criterion-referenced testing in vocational education. What is needed, why it is needed and possible roles for V-TECS, States, and LEA's will be the topics of this discussion.

Writing and Reviewing Test Items: Multiple Choice, Matching, Performance

Ora Kromhout

The presentation will cover the following topics: Choosing the type of test (written selection items, written supply items, performance); writing multiple choice items, matching items, and performance items; level of items; procedures for reviewing and revising items; validity of items; subject-area review and test/editing review; field testing guidelines; analysis of results, and revision; suggestions for planning a test ("blueprinting").

CAROUSEL SESSIONS

Accessing the Michigan Test Item Bank: On-Line Demonstration

Chris Olson

An on-line demonstration will be presented showing the characteristics of the Michigan Student Assessment Test Item Bank. Specifically, tests will be generated, modified, and merged. Audience participation will be welcome. Examples of tests and scoring results will be available for review.

Applied Test Item Banking - Georgia

Dick Grover

Georgia's vocational item banks are designed for use by classroom instructors to improve the quality of their classroom testing. The test items are developed by the state and keyed to the state curriculum guides. Computer software is being developed for use by classroom instructors to:

create,
print,
score,
interpret and
report

tests and test results. Test and item statistics will also be saved by the software. This data will be sent to the state on disks for analysis to use in updating the item bank.

Georgia's test item development model has been in place for several years and, having served as the basis for the V-TECS test item development model, is well know and proven. What's new is the delivery system for the items, i.e. the software, instructor training and state-level management of the process.

This session will focus on what we have learned in 18 months of delivery system development. We will discuss what works and, perhaps more importantly, what doesn't work.

Georgia is currently in the process of developing its own software delivery system. Preliminary details of this software will be discussed along with information about its potential availability to other states.

Florida's Testing Program

Warren Harrell

The presentation will address the Florida initiatives relative to establishing and maintaining an achievement testing program; i.e., given that the major objective of a student achievement testing program is to improve the quality of instruction and enhance learning, a critical issue becomes the necessity to be able to access readily available, content valid and acceptably performing test items; coded with appropriate attributes, blueprinted commensurate with current curriculum frameworks; and, available in an automated format. Further, the teachers must "buy" ownership in the system. These issues have emerged as the critical initiatives in developing the Florida Achievement Testing Program. Florida's objectives, assumptions, and activities designed to address these critical issues will be discussed in detail.

North Carolina VoCATS

Meg Murphy and Myrtle Stogner

A demonstration Model for "Obtaining Competency-Based Achievement Data on Students Enrolled in High School Vocational Programs" has been developed and piloted in the Vocational Education Programs in Richmond County Schools in North Carolina. The Model involves the use of a computerized data based including all North Carolina course competencies and objectives, competency keyed test items, teacher developed course specifications, and student information.

Occupational Testing - What We Do In Oklahoma

Brenda Stacy

This presentation will provide an opportunity for the participants to learn about the test development and utilization procedures executed in Oklahoma. Packets of sample materials will be disseminated to participants. Time will be allowed for questions and answers.

Pennsylvania Skills Certificate

William Reilly

This session will address specific policies governing the operation of Pennsylvania's competency testing programs as well as issues still to be resolved. In addition to allowing time for participant questions, an introductory presentation will speak to developmental challenges such as:

a. How 56 tests cover approximately 97 percent of the 115 different vocational program offerings in Pennsylvania.
b. Performance and written test components.
c. Legal issues such as the potential for discriminatory practices, cut-off scores for the skills certificate and the scope and sequence of the test.
d. Intersection with licensure occupations such as cosmetology.
e. Local administration of tests.
f. Why SOCAT?
g. Use of V-TECS test item bank.
h. Long-range expectations.

V-TECS Test Item Banks

Brenda Hattaway and Ron McCage

In light of constantly changing technologies there is a great need for educators to be able to more quickly and more thoroughly meet the ever changing requirements of business and industry. The primary activity of the Vocational-Technical Education Consortium of States (V-TECS) since its formation in 1973 has been to define and analyze occupations to prepare competency-based curriculum materials. Individuals who educate and train persons in all settings -- public and private, post-secondary and secondary, education and industry -- can effectively use these materials to provide current, valid vocational information upon which to base decisions, plan programs, develop curriculum and evaluate instructional systems.

This presentation will focus on the development of criterion-referenced test item banks using the V-TECS process. First, a brief overview of V-TECS will be presented with emphasis on catalog development, since the catalog page is the starting point for item development. Participants will be shown how the V-TECS item banks have been computerized.

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

About the Presenters

J. BARRY BALLARD

Dr. J. Barry Ballard has been the Director of the State Vocational and Technical Education Division since his appointment by the State Board of Vocational Education, and confirmation by the Governor, on July 1, 1981. The 1981 Arkansas General Assembly created the Division as a separate state agency to administer, supervise and coordinate all vocational, technical, and adult education and industry training programs.

His education includes a high school vocational drafting certificate and Associate of Science, Bachelor of Science, Master of Science, and Doctorate of Education degrees. His graduate work at Oklahoma State University focused on the areas of vocational technical education and higher education administration. Prior to coming to Arkansas, he was the Dean of Instruction at the Texas State Technical Institute, Waco, Texas. Professional experiences prior to that included vocational education planning in Louisiana, a consultant to the Brazilian Ministry of Education in Rio de Janeiro on a project to plan and build six technical institutes throughout Brazil, an assistant state supervisor of technical education in the Oklahoma Department of Vocational Education, and a department head and instructor of drafting and design technology in a community college. He also has worked in industry as an engineering technician.

Dr. Ballard's work in vocational education is important to Arkansas because the system he directs is helping thousands of people develop marketable job skills. With marketable skills, the unemployable become the employed, tax-paying, producing, contributing members of society. Vocational education is also important to the state because it provides the training of skilled workers and technicians needed by new businesses and industries being recruited to Arkansas and by existing business and industries which are expanding or retraining their workforce.

RICHARD C. ERICKSON

Dr. Richard C. Erickson is in the eleventh year of his appointment as Professor and Chair, Department of Practical Arts and Vocational-Technical Education, University of Missouri-Columbia. His baccalaureate, masters, and doctor of philosophy degrees were earned at University of Northern Iowa, University of Maryland and Purdue University, respectively. Prior to joining the University of Missouri faculty, he held professional appointments at Northern Illinois University and at Purdue University. He has for many years taught graduate classes in measurement and evaluation in vocational education. His writing in this area includes test reviews published in the Buros' Mental Measurements Yearbook series; a chapter on measuring psychomotor and performance skills and a chapter on assessing vocational instructional published in the ACIATE and AVA yearbooks, respectively; and Measuring Student Growth, Procedures and Techniques in Occupational Education, the textbook he co-authored with Tim Wentling.

THOMAS FISHER

Dr. Thomas H. Fisher has been Director, Student Assessment Section, Florida Department of Education, since 1976, and is responsible for Florida's student minimum competency testing program in grades K-12 and for the Florida Teacher Certification Examination. He has served as advisor on testing issues in several states. He has authored numerous publications and is a frequent speaker on testing and accountability issues at professional meetings.

RICHARD GROVER

Mr. Richard Grover is the Director of the Planning and Evaluation Unit of the Georgia Department of Education. The responsibilities of this unit include vocational planning, vocational equity, evaluation of vocational programs, management of four regional data centers, vocational research and test item banking.

Prior to coming to the State Department, Dick worked in South Carolina as a school psychologist and in Georgia as a field representative for The Psychological Corporation.

L. WARREN HARRELL

Dr. L. Warren Harrell is a rarity, a native Floridian - born and raised on a strawberry farm and cattle ranch in Central Florida. He received his B.S. in Agriculture and Master of Education degrees from the University of Florida. His Doctorate of Education in the area of Administration, Vocational, Technical and Occupational Education, was awarded by Nova University.

Dr. Harrell has been assigned the responsibility of directing the Evaluation Section, Division of Vocational, Adult and Community Education, Florida Department of Education, since August 1, 1987. Prior to this appointment, he was the administrator for the Vocational Division's five regional offices from December 1975 until August 1987. The regional offices were comprised of program specialists responsible for providing technical assistance and evaluation services for local vocational district and college programs.

He joined the Department of Education in September 1966 as an Area Supervisor and later served as a Coordinator and Director of the Region III Office in Orlando. Prior to joining the Department, he was a county vocational supervisor. Also, he taught vocational agriculture for fifteen years in Polk County, Florida.

BRENDA C. HATTAWAY

Ms. Brenda C. Hattaway is Assistant Director of The Vocational-Technical Education Consortium of States (V-TECS). She is responsible for coordinating the development and revision of V-TECS catalogs, guides and test item banks and for providing technical assistance in the development and utilization of these products. Previous positions include Student Evaluation Coordinator for the Office of Vocational Education, Georgia Department of Education and Test Development and Analysis Specialist for the Regents' Testing Program, University System of Georgia. She has taught mathematics at the college level and graduate courses in educational research methodology. As a private statistical consultant, she worked with such companies as Coca-Cola, USA and Peat, Marwick, Mitchell Company.

Ms. Hattaway received her A.B. and M.A. degrees in mathematics from West Georgia College. She has completed the course-work and comprehensive examination at Georgia State University for her Ph.D. in Research, Statistics and Measurement.

She is an active member of several state and national professional organizations including the National Council on Measurement in Education, the American Vocational Association, and Kappa Delta Pi.

BARBARA E. HINTON

Dr. Barbara Hinton is the V-TECS Technical Coordinator for Arkansas and an Instructor of Vocational Education, University of Arkansas. She is presently directing student competency testing for the state's secondary and postsecondary vocational students. Her past experience includes development of a Model Articulation Program for Arkansas, development of Mathematics and Communications Curricula for Arkansas' Postsecondary Schools, and teaching Adult Education (ABE-GED) at Northwest Vocational Technical School, Springdale, Arkansas.

Dr. Hinton has a B.S. Ed. in English and music from Auburn University, a M.S. Ed. in English and reading and an Ed.D. in Adult Education from the University of Arkansas.

ADDISON S. HOBBS

Dr. Addison S. Hobbs has worked in vocational education for thirty-nine years. After receiving his Bachelor's Degree from the Hampton Institute in 1948, he began his seventeen year teaching career as Industrial Education Coordinator and Teacher at the Winn Parish Training School in Winnfield, Louisiana. After four years, he moved back home to Washington, D. C. where he completed his secondary teaching career in graphic arts.

Dr. Hobbs' last twenty years in vocational education have been spent as a supervisor in the DC Public Schools, Director of a teacher education program at the Washington Technical Institute and State Director in Michigan and presently, Maryland.

Along the way, Addison managed to earn a M.A. at New York University and an Ed.D. at Rutgers. These past ten years have been exceptionally busy ones for Dr. Hobbs. He has often been called upon nationally to author articles for a variety of professional journals, served as a consultant on vocational matters and he has been appointed to numerous vocational committees.

Closer to home, Addison has been appointed by the Governor to serve on six councils, boards or task forces.

Among his honors and awards, Dr. Hobbs has received: the "Script Key" for outstanding service as a Production Manager for Hampton's school newspaper; Outstanding Industrial Arts Teacher Award in the DC Public Schools; a Fellowship to study at the Rutgers University; Honorary State Farmer Award in Maryland and Guest Editor to the "AVA Insider."

Dr. Hobbs is a member of the Executive Board of the newly created Advisory Council for the Center on Vocational Education-Business Cooperation partnership co-sponsored by the National Alliance of Business and the Consortium of State Directors for Vocational Education; serves on the Board for Productivity and Quality of Working Life at the University of Maryland; and is Past-President of the National Association of State Directors of Vocational Education.

JOHN HORTON

Mr. John Horton has worked in the Kentucky Department of Education, Office of Vocational Education for sixteen years. He has held various jobs in the Department including: Program Supervisor, Coordinator for Program Evaluations, Coordinator for Research, and Director of the Curriculum Development Center. He is presently the Assistant Director for the Support Services Division, which includes a staff of twenty-five people who develop curriculum, conduct research, monitor exemplary projects, compile occupational information, provide sex equity, and administer a statewide testing program called KVAT.

He has guided a project which developed 118 occupational tests. The project included over 250 people involved in writing over 10,000 test questions for the KVAT program.

Mr. Horton has made presentations in ten different states in the last three years related to test development. He is a frequent consultant at universities, local districts, and other educational groups.

ORA M. KROMHOUT

Dr. Ora M. Kromhout supervises the Test, Measurement, and Evaluation Department of the Florida State University Center for Instructional Development and Services. Activities within that department include statewide projects to develop test item banks for vocational student testing, subject-area tests for academic and vocational teacher certification, training workshops for educators on writing test items and developing test, and needs assessment projects.

Dr. Kromhout has a Ph.D. in instructional systems design from Florida State University, and bachelor's and master's degrees in Physics from Tulane University and the University of Illinois. Her previous professional work has included research in physics and electrical engineering laboratories, development of computer-assisted instruction in physics and in mathematics, instructional design of vocational education materials, including the Florida Employability Skills Series, as well as statewide needs assessment projects to determine in-service training needs of vocational instructors, and to identify priorities for state projects in instructional materials development. She has presented numerous workshops on test development in Florida, as well as in other states and in Canada.

CHARLES LOSH

Dr. Losh is presently at Weber State College in Ogden, Utah, serving as Director of State-Wide Vocational-Technical Inservice and Instructional Systems Development. Previous positions include Assistant State Director of Vocational Education in Utah, and State Supervisor of Technical, Trade, and Health Occupations programs in North Dakota. He has served as Assistant Director of the Vocational-Technical Education Consortium of States (V-TECS), and Director of the Automobile Mechanic Training Evaluation Project (AMTEP). He has held positions as a curriculum and media specialist in a technical school and as a vocational instructor. His occupational background includes experience as an automobile mechanic and an electronic technician.

He holds a B.S. degree in Industrial Education from the University of Nebraska, M.S. and Ed.S. degrees in Instructional Systems Technology from Indiana University, and a Ph.D. in Vocational Education from Georgia State University.

Dr. Losh is Editor of the American Technical Education Association Journal and has published materials on funding technical education programs, implementing competency-based technical instruction programs, and developing evaluation materials and systems.

He is a member of numerous professional associations including Phi Delta Kappa, the American Technical Education Association, and the American Vocational Association.

ANNE L. MATTHEWS

Dr. Anne L. Matthews is Assistant Director of Vocational Education for the State Department of Education in South Carolina. She is responsible for programmatic and curriculum activities in vocational education. She has taught at the high school, technical college, and university levels.

Dr. Matthews has received national appointments from President Reagan, chaired several national task forces, and served as president of three professional associations at the national level. She has written numerous articles and is the co-author of business texts/simulations.

Dr. Matthews is the current chairman of the V-TECS Board of Directors.

CHRIS OLSON

Dr. Chris Olson is an Associate Professor at Michigan State University. During his twelve years at MSU, he has been involved in a number of curriculum development and articulation projects including the Michigan Occupational Data Analysis System (MODAS). Currently, he is the Director of Occupational Research and Assessment.

Dr. Olson received B.S. and M.A. degrees in Industrial Education from Northern Michigan University. He also holds a M.A. in guidance from Northern Michigan. His Ph.D. in Continuing and Vocational Education was earned at the University of Wisconsin at Madison.

WILLIAM J. REILLY

Mr. William J. Reilly is the Chief of the Division of Vocational Education Planning, Development and Evaluation Services in the Pennsylvania Department of Education. He has twenty-four years experience as a vocational educator -- ten years as a teacher and coordinator of cooperative education programs and fourteen years as a state-level administrator of vocational education. He received his B.S. degree from Bloomsburg State University and Ed.M. degree from Temple University. He has done advanced graduate work at Western Michigan University and the University of South Florida.

Mr. Reilly is an active member of a number of national and state organizations including the American Vocational Association, the National Association of State Directors, the Pennsylvania Association of Vocational Educators and the Pennsylvania Vocational Administrators of Pennsylvania. He is currently serving as Pennsylvania's member of the V-TECS Board of Directors.

FRED RENEAU

Dr. Fred Reneau is in the ninth year of a joint appointment in the Departments of Vocational Education Studies and Agricultural Education & Mechanization, Southern Illinois University-Carbondale. He earned baccalaureate and masters degrees at Western Kentucky University and his doctorate degree at Virginia Tech. He has for the past eight years taught classes in measurement and evaluation. He has served as project director on several task analysis and test item development curriculum projects.

BRENDA STACY

Dr. Brenda Stacy is the Coordinator of the Evaluation and Testing Unit of the Oklahoma State Department of Vocational and Technical Education. In addition to the Coordinator, the Evaluation and Testing Unit staff consists of three Testing Specialists and one Evaluation Specialist. Brenda has served as Coordinator of this Unit since 1986 and previously worked as Evaluation Specialist from 1983-1986. Dr. Stacy currently serves in the capacity of V-TECS Technical Coordinator for Oklahoma and is a member of the V-TECS Process/Product Review Committee.

PRESENTERS' NAMES & ADDRESSES

Dr. J. Barry Ballard
State Director
Vocational and Technical Education
Division
Three Capitol Mall
Little Rock, Arkansas 72201

Dr. Richard C. Erickson
Professor and Chair
Practical Arts and Vocational-Technical
Education
University of Missouri-Columbia
323 Townsend Hall
Columbia, Missouri 65211

Dr. Thomas S. Fisher
Director, Student Assessment Section
Florida Department of Education
506 Knott Building
Tallahassee, Florida 32301

Mr. Richard Grover, Director
Planning & Evaluation Unit
1762 Twin Towers East
Atlanta, Georgia 39334

Dr. L. Warren Harrell,
Director, Evaluation Section
Bureau of Vocational Research,
Dissemination and Evaluation
Division of Vocational, Adult and
Community Education
Florida Department of Education
Knott Building
Tallahassee, Florida 32399

Ms. Brenda C. Hattaway
Assistant Director
Vocational-Technical Education
Consortium of States
1866 Southern Lane
Decatur, Georgia 30033-4097

PRESENTERS' NAMES & ADDRESSES
(continued)

Dr. Barbara E. Hinton
Technical Coordinator, Student
Competency Testing
GE Room 100
University of Arkansas
Fayetteville, Arkansas 72701

Dr. Addison S. Hobbs
Assistant State Superintendent for
Vocational-Technical Education
200 West Baltimore Street
Maryland State Department of Education
Baltimore, Maryland 21201

Mr. John Horton, Assistant Director
Support Services Division
2024 Capital Plaza Tower
Frankfort, Kentucky 40601

Dr. Ora M. Kromhout
Supervisor, Test, Measurment, and
Evaluation Department
Center for Instructional Development
and Services
2003 Apalachee Parkway
Tallahassee, Florida 32301-4829

Dr. Charles Losh
Director of Inservice & Curriculum
Mail Stop 1302
Weber State College
Ogden, Utah 84408

Dr. Anne L. Matthews
Assistant Director, Vocational Education
State Department of Education
904 Rutledge Building
Columbia, South Carolina 29201

PRESENTERS' NAMES & ADDRESSES
(continued)

Ms. Meg Murphy
Chief Consultant
Research & Development Unit
Department of Public Instruction
534 Education Building
Raleigh, North Carolina 27603-1712

Dr. Chris Olson, Assistant Professor
and Project Coordinator
MSU Curriculum Resource Team
100 Wills House
Michigan State University
East Lansing, Michigan 48824

Mr. William J. Reilly
Chief, Division of Vocational Education
Planning, Development and Evaluation
Services
Pennsylvania Department of Education
333 Market Street, 6th Floor
Harrisburg, Pennsylvania 17126-0333

Dr. Fred Reneau
Project Director
Department of Agriculture Education
and Mechanization
Southern Illinois University
at Carbondale
Carbondale, Illinois 62901

Dr. Brenda Stacy
Coordinator of Evaluation & Testing Unit
State Department of Vocational-
Technical Education
1500 West Seventh Avenue
Stillwater, Oklahoma 74074

Ms. Myrtle Stogner
Vocational Director
Richmond County
P. O. Box 1259
Hamlet, North Carolina 28345

VENDOR'S NAMES & ADDRESSES

Career Success Magazine
Dr. Barbara Orwig
Director of Marketing
1200 East Highway 210
Liberty, Missouri

Educational Data Systems, Inc.
Mr. Dennis Guzik
22720 Michigan Avenue
Dearborn, Michigan 48124

Marked Resource Center
Ms. Beth M. Osteen
Curriculum Specialist
1375 King Avenue
Columbus, Ohio 43212

Mid-America Vocational Curriculum Consortium
Mr. Jim Steward
1515 West Sixth Avenue
Stillwater, Oklahoma 74074

National Occupational Competency Testing Institute
Mr. Allan P. Chrenka
Ferris State University
609 Bishop Hall
Big Rapids, Wisconsin 49307

Piney Mountain Press, Inc.
Mr. Cliffe Rice
P. O. Box 333
Cleveland, Georgia 30528

Vocational-Technical Education Consortium of States
Ms. Brenda C. Hattaway
1866 Southern Lane
Decatur, Georgia 30033-4097

Vo-Tech Data Systems, Inc.
Ms. Pat Spears
P. O. Box 3951
Tallahassee, Florida 32315

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Conference Survey

We will appreciate your taking a few moments to complete this survey. You do not have to sign the form.

A. Please rate the following apsects of our conference on a scale to 1 to 5, with 5 being the very best.

_______ 1. Notification of conference dates, deadlines, and information.

_______ 2. Registration procedures.

_______ 3. Notebook Materials.

_______ 4. Conference facilities (meeting rooms, media, sound systems, etc.)

_______ 5. Refreshments.

_______ 6. Agenda (arrangement of events).

_______ 7. Appropriateness of presentations.

_______ 8. Hotel accommodations.

B. Please use the space below to write any comments you may have. Your thoughts on how the Conference could have been improved and any recommendations you might have for future conferences will be most appreciated. Feel free to say how you feel about any aspect of this conference.

____

____

____

____

____

____

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Conference Survey
(continued)

C. Please rate each session that you attended on a scale of 1 to 5, with 5 being the very best.

CONCURRENT SESSIONS

______ PANEL DISCUSSION: APPROACHES TO COMPETENCY-BASED TESTING
Dick Grover, Bill Reilly, Brenda Stacy

______ IDENTIFYING AND VALIDATING TASK LISTS BY BUSINESS & INDUSTRY FOR TEST/TEST ITEM DEVELOPMENT
Charles Losh

______ LEGAL ISSUES CONCERNING COMPETENCY-BASED TESTING
Tom Fisher

______ CONDUCTING A TASK ANALYSIS FOR COMPETENCY-BASED TEST ITEM DEVELOPMENT
Brenda Hattaway

______ WRITING AND REVIEWING TEST ITEMS: MULTIPLE CHOICE, MATCHING, PERFORMANCE
Ora Kromhout

______ MANAGING THE DEVELOPMENT OF A COMPUTERIZED TEST ITEM BANK
Chris Olson

______ STATISTICAL ANALYSES FOR CRITERION-REFERENCED TEST ITEMS
Richard Erickson

______ CONSTRUCTING A COMPETENCY-BASED TEST
John Horton

______ FIELD TESTING STRATEGIES
Barbara Hinton

CAROUSEL SESSIONS

______ FLORIDA'S TESTING PROGRAM
Warren Harrell

______ APPLIED TEST ITEM BANKING - GEORGIA
Dick Grover

______ MICHIGAN
Chris Olson

______ NORTH CAROLINA VoCATS
Meg Murphy
Myrtle Stogner

______ OCCUPATIONAL TESTING -- WHAT WE DO IN OKLAHOMA
Brenda Stacy

______ PENNSYLVANIA SKILLS CERTIFICATE
Bill Reilly

VENDOR CAROUSEL

______ VENDOR CAROUSEL

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Identifying and Validating Task Lists by Business & Industry for Test/Test Item Development

Presented
by

Charles Losh
Utah

Tuesday, April 12
8:30 am - 9:30 am
10:00 am - 11:00 am
11:15 am - 12:15 pm

IDENTIFYING AND VALIDATING TASK LISTS
BY
BUSINESS AND INDUSTRY
FOR
TEST/TEST ITEM DEVELOPMENT

Charles Losh, PhD

National Conference on Critical Issues
in
Competency-Based Testing for Vocational-Technical Education
April 11-13, 1988
Nashville, Tennessee

CBVE

Competency Based Vocational Education (CBVE) is an instructional process utilizing business-industry validated task lists, pre-specified performance objectives, competency-based tests, and a systematic content identification and delivery process.

In many instances, discussions on CBVE use the terms task and competency interchangeably. This lack of definition causes significant communication problems, and the following distinction is proposed.

> A task is always directly derived from work place data (see Appendix A). A competency is an instructional construct, generally but not always derived from a specific workplace task.

The major identifying characteristics of a CBVE system are (a) the identification of specific tasks performed in the occupation, (b) the subsequent validation of those tasks by workers and employers in the occupation, and (c) the development of performance standards to define task mastery. A fundamental assumption of CBVE is that almost all students can learn to perform and achieve success in the classroom, lab and the world of work.

Once the specific tasks to be covered in the program have been identified and verified, performance objectives that include the tasks, conditions of performance and standards of competent performance are identified. Ultimately, competency-based tests are identified/developed to determine mastery.

Assumptions

The following assumptions relate to a CBVE delivery system:

1. In the majority of instances, the base and content of a conventional program reflect an instructors perception of what a student needs to KNOW, whereas a CBVE program specifically identifies what the student needs to be able to DO. In a CBVE program, what a student needs to know is based on needs rather than instructor beliefs. In a CBVE program, instruction and testing is PERFORMANCE based and students ability to MASTER validated performance standards is emphasized.
2. The tasks performed by incumbent workers in an occupation can be identified, defined and validated by incumbent workers.
3. The tasks that require competent performance upon employment (entry level tasks) can be identified by incumbent workers and employers of incumbent workers.
4. Entry level tasks identified and validated by incumbent workers and employers of incumbent workers provide the BASE of all further occupation specific development including performance and written test items, and the identification/development of curriculum materials.

Task List Validation Model

The following steps are part of a larger model for implementing CBVE (see Appendix B). In this instance, only the initial steps are shown.

Conduct needs analysis. A needs analysis should be conducted to determine if there is or is not a demand for employees in the occupation(s), and completers of the proposed program.

Establish program advisory committee. A program advisory committee must be organized (if none exists) that includes both workers and supervisors/employers from the business/industry of concentration.

Obtain/synthesize a task list. The program advisory committee reviews a task list (see Appendix C) from a V-TECS catalog, ODAS, or other sources to determine program content base by answering the following questions (the answers -- tasks -- that are identified are only as good as the questions):

1. Which tasks on this list are presently performed in the occupation?
2. Which tasks are no longer performed and should be deleted from the list?
3. What tasks need to be added to the list due to changing technology?
4 Which tasks on this list must be covered in a program for the completer to be "entry level competent?"
   NOTE: "Entry level competent" is defined as having demonstrated MASTERY of the entry level tasks.
5. Which tasks on this list are not entry level, but if competently performed, would enhance the completers employability and advancement opportunities?

Sources of Task Lists

V-TECS Catalogs. The primary source of validated occupational task lists available to test developers is the V-TECS Catalogs. A V-TECS "Catalog" is not a catalog in the common sense of the term, that is, a document wherein products are identified and the shopper can pick and choose products as desired. V-TECS Catalogs are the product of an occupational and task analysis of an occupation, using worker input to accurately describe and define the occupation. A V-TECS Catalog consists of the following worker validated components:

1. Identification of major work activities called "duty" areas.
2. A list of tasks performed in the occupation.
3. Performance objectives for each task.
4. Performance guides or steps for each task.
5. A list of tools and equipment used in the occupation.

Although as a test developer you will be interested in all of the components, the task list is the portion used during the validation activity.

ODAS. The Occupational Data Analysis System (ODAS) is a computerized data base designed to facilitate specialized task sorts for curriculum development, identification of training and retraining needs and other counseling purposes. Tasks are labeled with a "key word" or words providing a method of clustering tasks for various requirements. Task lists are also coded to the "VPO" (Vocational Preparation for Occupations). This linkage provides information as to GED level, physical demands, working conditions, aptitudes and interests associated with specific jobs.

Once again, as a test developer you may be interested in many of the components, but initially you should be aware of these ODAS capabilities:

1. The ability to identify the tasks on an occupation specific basis, and
2. The ability to synthesize task lists for special job training programs or new and emerging occupations (which in most instances are combinations of tasks from existing occupations).

Discussion

As can be seen from the model and implementation process, the primary component of a CBVE program and the base for competency-based test/test item development is a task list that is validated by the program advisory committee. For this activity to be as effective as possible, it is critical that the committee consist of workers (not instructors) that are involved on a daily basis in the occupation, as well as individuals directly responsible for the "hire or not hire" decision. This mix of expertise will provide feedback as to specific tasks workers in the occupation actually perform, and the performance, knowledge, and skill level that is expected of entry level employees. Although instructors can read professional journals and have contact with individuals in the occupation, advisory committee review of a task list is the best method for identifying tasks currently performed and critical to competent performance.

Once validated by the committee, the tasks and related competencies are ready for analysis and inclusion in the test item bank and the program. In most instances, all tasks performed in an occupation cannot or should not be covered in a training program. Some tasks are equipment specific; some are best trained for on-the-job; and in some instances, the training facility may be inadequate or the instructor may not be qualified to teach the task. These are a few of the reasons that local committee validation is imperative prior to developing a programmatic test for local use.

A task list is readily available for nearly any occupation you can name. However, the list may not be up-to-date due to rapid change in the occupation, or may need to be a composite of several other lists (many occupations that are changing have technological impact that has already hit other occupations). Therefore, the draft task list will need significant amounts of advisory committee input. The point is, there is little need to start with a blank sheet of paper as is done in the DACUM process. Obtain or synthesize a draft task list that seems to "fit" the program, and give the list to the advisory committee as a "pump primer." With an exact definition of a task and a group leader that asks the right questions (remember that the answers are only as good as the questions!), the committee will quickly determine what the task/competency list BASE of the program should be. Once the task base has been validated, the test developer can begin to analyze the tasks and develop competency-based test/test item banks for the course or program.

Competency Based Testing is one tool that will help cope with the impact of change on vocational-technical programs, with a major plus being enhanced employer advisory committee participation in program activities. In some instances, implementing CBVE and a competency-based testing program may mean the difference between the ability to up-date and retain a program, or elimination of a program due to out-dated content. The implications of a validated task base are far reaching for the future of vocational-technical education.

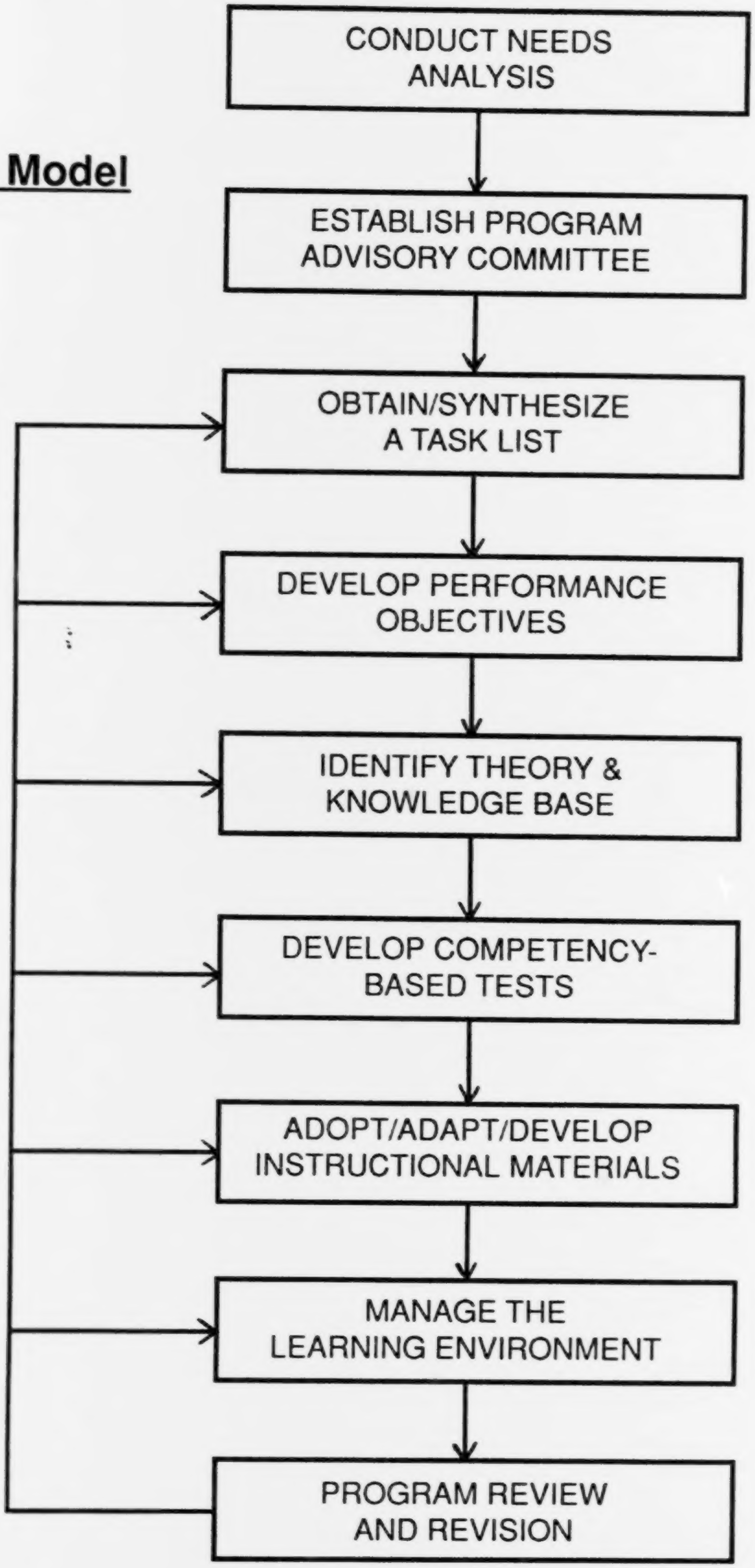
APPENDIX A

TASK STATEMENT CHARACTERISTICS

1. A task is associated with a specific job title in the occupation.
2. A task, when competently performed, results in the completion of a product or a process.
3. A task has a definite beginning and ending point.
4. A task contains two or more steps, none of which is a restatement of the original task statement.
5. A task has a standard of performance which can be defined,described and verified.
6. A task statement must begin with a present-tense verb.
7. A task should be singular in nature.
8. A task list must be comprehensive and reflect independent units of work performed by incumbents in the occupation.
9. A task statement must be written in the language of the occupation.
10. A task statement must not use abbreviations.
11. A task statement must not include redundant, qualifying phrases such as "when appropriate", "as required", "in accordance with prescribed directions", "proper" or "correct use of" (these are understood).

APPENDIX B

CBVE Model


CONDUCT NEEDS ANALYSIS
ESTABLISH PROGRAM ADVISORY COMMITTEE
OBTAIN/SYNTHESIZE A TASK LIST
DEVELOP PERFORMANCE OBJECTIVES
IDENTIFY THEORY & KNOWLEDGE BASE
DEVELOP COMPETENCY-BASED TESTS
ADOPT/ADAPT/DEVELOP INSTRUCTIONAL MATERIALS
MANAGE THE LEARNING ENVIRONMENT
PROGRAM REVIEW AND REVISION

APPENDIX C

ROBOTICS TECHNICIAN TASK LIST

A PLANNING, JOB ESTIMATING, AND COMMUNICATING

001 Schedule work assignments
002 Schedule use of equipment and materials
003 Estimate cost of installation
004 Estimate cost of repairs and cost of downtime
005 Conduct operator training
006 Conduct follow-up review of training
007 Perform safety inspection of work site
008 Develop preventive maintenance program
009 Write technical report
010 Maintain service record
011 Write purchase requisition

B INSTALLING ROBOTS

001 Install electric robot
002 Install hydraulic robot
003 Install pneumatic robot
004 Evaluate (initial start-up) installed electric robot system
005 Evaluate (initial start-up) installed hydraulic robot system
006 Evaluate (initial start-up) installed pneumatic robot system
007 Fine tune (qualify) robot system
008 Fine tune (qualify) hydraulic robot system
009 Fine tune (qualify) pneumatic robot system
010 Install electric end of arm tools (end effectors)
011 Install hydraulic end of arm tools (end effectors)
012 Install pneumatic end of arm tools (end effectors)
013 Verify system interlock operation
014 Install robot controller
015 Install communication links
016 Optimize existing system performance

C PROGRAMMING ROBOTS

001 Develop flow chart

002 Develop written program
003 Enter executive software into control unit
004 Load program into robot
005 Test program
006 Operate teach mode
007 Interpret error messages
008 Run diagnostic routine

D MAINTAINING AND REPAIRING ELECTRIC ROBOTS
001 Troubleshoot end effector(s)
002 Troubleshoot system interlock operation
003 Troubleshoot robot controller
004 Calibrate position feedback device
005 Troubleshoot automatic lubrication system
006 Troubleshoot robot vision system
007 Verify pressure control system
008 Troubleshoot pressure or vacuum switch operation
009 Troubleshoot shock mounts/vibration dampers
010 Verify drive mechanism
011 Troubleshoot timing of cam system
012 Service bearing(s)
013 Adjust clutch/brake system
014 Adjust linkage
015 Troubleshoot overload protection device operation

E MAINTAINING AND REPAIRING HYDRAULIC ROBOTS
001 Inspect hydraulic pump
002 Replace hydraulic pump
003 Troubleshoot hydraulic control valve operation
004 Test accumulator charge
005 Recharge accumulator
006 Replace defective accumulator
007 Troubleshoot hydraulic actuator
008 Replace hydraulic actuator
009 Replace hydraulic filter(s)
010 Troubleshoot cooling/air-conditioning system

011 Change hydraulic oil
012 Troubleshoot heat exchanger
013 Null hydraulic servo valve(s)
014 Check hydraulic fluid levels
015 Troubleshoot pressure regulator(s) on hydraulic robot
016 Troubleshoot air logic system
017 Clear restriction from sealed hydraulic system

F MAINTAINING AND REPAIRING PNEUMATIC ROBOTS

001 Troubleshoot air pressure regulator(s) on pneumatic robot
002 Troubleshoot pneumatic pump
003 Verify pneumatic flow control valve(s) operation
004 Troubleshoot pneumatic actuator
005 Replace defective pneumatic gauge(s)
006 Replace defective pneumatic lines(s)
007 Replace air filter
008 Fill air line lubricator
009 Troubleshoot pneumatic pressure switch operation
010 Service pneumatic air compressor
011 Replace pneumatic air compressor
012 Verify air motor
013 Replace air motor
014 Sequence pneumatic cylinders
015 Troubleshoot automatic lubrication system on pneumatic robot
016 Replace pneumatic cylinder(s)
017 Verify humidity control
018 Verify air logic to diagram
019 Leak-test vacuum/pressure system
020 Clear restrictions from sealed pneumatic system

G MAINTAINING AND REPAIRING ELECTRICAL SYSTEMS

001 Replace defective relay
002 Verify electrical sensor operation
003 Verify motor starter circuit
004 Verify electric motor operation
005 Troubleshoot internal interlock operation

006 Verify thermostat operation
007 Verify humidity control
008 Verify power supply operation
009 Verify solenoid operation

H MAINTAINING AND REPAIRING ELECTRONIC SYSTEMS
001 Troubleshoot motor
002 Verify servo amplifier operation
003 Verify servo motor control circuits
004 Verify terminal device operation
005 Troubleshoot communication links
006 Troubleshoot mass storage device
007 Troubleshoot printed circuit board
008 Troubleshoot electronic sensor
009 Calibrate position feedback device
010 Troubleshoot position feedback device

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Conducting a Task Analysis for Competency-Based Test Item Development

Presented
by

Brenda Hattaway
V-TECS

Tuesday, April 12
8:30 am - 9:30 am
10:00 am - 11:00 am
11:15 am - 12:15 pm

TASK ANALYSIS TIPS

1. Arrange the tasks from simple to most complex before beginning the analysis.
2. Allow analysts to select groups of tasks to work on with which they are most comfortable.
3. Remember that the purpose of task analysis is to gather information to be used in the development of test items.
4. Focus on describing the knowledge, skills, and attitudes involved in performing the task on the job rather than on how the task should be taught.
5. If the task can be performed in more than one way, stick to the most common or the easiest method to master.
6. Be sure that all steps for a particular task have been identified before addressing the identification of knowledge, skills and attitudes.
7. Materials such as V-TECS catalogs, shop manuals, procedure sheets, and manufacturer's technical bulletins are good sources for task steps, knowledge, and skills.
8. Begin each step, knowledge, skill, and attitude with an action verb.
9. List knowledge that is needed to perform the steps. Do not include "nice to know" information.
10. Some steps will not require specific knowledge, skills or attitudes for performance.
11. Continue the identification of knowledge and skills until the entry level of the target population is reached. It is a good idea to make a list of entry level knowledge and skills before the analysis begins.
12. Do not include trivial steps that would be common knowledge or obvious such as "pick up pliers" or "walk over to patient."
13. Keep in mind that some basic tasks may appear as a single step in the analysis of more complex tasks.

TASK ANALYSIS WORKSHEET

Occupational Title or Catalog Title:

Writer:

Job Duty Area:

Date:

Task Number:

Performance Objective #:

Task Statement:

Special Conditions, Supplies, Tools, and Equipment for Performance of Task:

Standard of Performance of Task:

PERFORMANCE STEPS	KNOW	DO	SAFETY FACTORS AND/OR EMPLOYABILITY SKILLS

TASK ANALYSIS WORKSHEET

Occupational Title or Catalog Title: *Automobile Mechanics*

Writer: *Gene Smith*

Job Duty Area: *Electrical Systems*

Date: *October 15, 1987*

Task Number: *90*

Performance Objective #: *90*

Task Statement: *Replace a defective switch*

Special Conditions, Supplies, Tools, and Equipment for Performance of Task:

Defective switch, ohmmeter, new switch, flat-head screwdriver, open-end wrenches

Standard of Performance of Task: *Performance will be rated by a performance checklist.*

PERFORMANCE STEPS	KNOW	DO	SAFETY FACTORS AND/OR EMPLOYABILITY SKILLS
1. Determine if switch is defective.	*1. ⓐ Operation of Ohmmeter* *b. Principles of a circuit*	*1. Check for continuity across terminals:* *a. Calibrate Ohmmeter* *b. Hook up leads* *ⓒ Take a reading*	*① Insure that power has been disconnected before performing Steps 1 and 2 in the DO column.*
2. Install new switch	*2. a. Tools and how to use them* *ⓑ Wire color codes*	*2. a. Remove defective switch* *(1) Disconnect wires* *(2) Disconnect fasteners* *b. Install new switch* *(1) Fasten switch* *(2) Fasten wires*	
3. Test new switch for proper functioning		*3. a. Reconnect power* *b. Turn switch on and off*	

NOTE: CIRCLES indicate knowledge test items; SQUARES indicate performance checklist.

DUTY: MAINTAINING AND REPAIRING ROBOTS

PERFORMANCE OBJECTIVE NO. 37

TASK: Troubleshoot pressure or vacuum switch operation

STANDARD: Pressure switches not closing at given pressure(s) must be identified.

CONDITIONS FOR PERFORMANCE OF TASK:

Standard tool kit
Manufacturer's specifications
Service record
VOM

PERFORMANCE GUIDE:

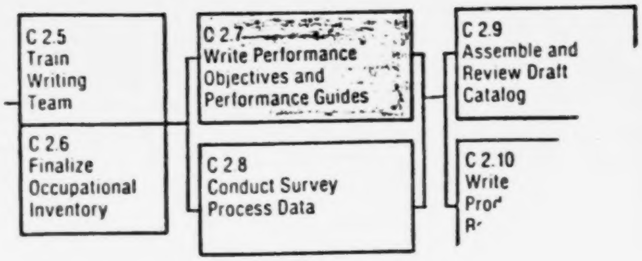
CAUTION: ENSURE THAT ROBOT ARM IS IN SAFE WORK POSITION AS PER MANUFACTURER'S SPECIFICATIONS.

1. Turn off robot power.
2. Remove wiring from output contact of pressure or vacuum switch.
3. Attach VOM across contacts.
4. Adjust air pressure while observing VOM.
   a. Proceed to step #5 if meter indicates contact closure at pressure level recommended in manufacturer's specifications.
   b. Proceed as follows if meter does not respond at recommended pressure.
      (1) Inspect for broken or pitted contacts.
      (2) Replace pressure switch if pitted or broken.
      (3) Repeat steps #3 and 4 until reading is consistent with manufacturer's specifications.
5. Connect wiring.
6. Inform authorized personnel if malfunction has not been corrected.
7. Return robot to service if malfunction has been identified and corrected.
8. Maintain service record.

SOURCE FOR STANDARD:

1 Writing Team of Incumbent Workers

C 2.7 WRITE PERFORMANCE OBJECTIVES AND PERFORMANCE GUIDES


C 2.5 Train Writing Team
C 2.6 Finalize Occupational Inventory
C 2.7 Write Performance Objectives and Performance Guides
C 2.8 Conduct Survey Process Data
C 2.9 Assemble and Review Draft Catalog
C 2.10 Write Prod R

After the occupational inventory has been reviewed and approved by the V-TECS central staff, the writing team begins to write performance objectives and performance guides for all of the tasks in the inventory. This procedure occurs simultaneously with the survey process.

Writing performance objectives and performance guides is coordinated by state staff or project personnel. Some state staff and project personnel prefer to write performance guides prior to writing the performance objectives, while others prefer to write the performance objectives first. This decision will be left to the discretion of the state staff and project personnel.

The Procedure

1. Write the performance objectives.

Using a **TASK WORKSHEET*** when writing performance objectives, the following should be performed.

a. State the following for each performance objective --

- Task;
- Conditions for performance of task;
- Standard for performance of task;
- Source of standard.

A task is a unit of work with a definite beginning and ending that is measurable and observable, consisting of two or more definite steps. (See page 71).

A Condition of Performance describes the situation, including tools and equipment to be used and limitations under which the tasks will be performed. (See page 71).

---

* See example, page 71.

A Standard is the criteria used to determine if a task has been successfully or unsuccessfully performed. (See page 71).

Standards may take many forms, including a description of --

- What the product should look like;
- What the product must not look like;
- Key points in the process;
  (Checklists should not be included in catalogs unless the incumbent worker would use a similar checklist on the job.)
- Time limits imposed;
  (A time limit should never be the only point of determining acceptable performance; rather, it should be accompanied by quality requirements. If time is not critical, do not include it in the standard.)
- The degree of accuracy in performing the task.

A Source of Standard is a person or document from which the information establishing the standard is received and includes --

- Published standards that are applicable to the task;
- The consensus input of the writing team members during the actual writing or review process.

Generally, the use of commercially prepared textbooks or teacher-developed curriculum materials are not used unless they have been verified by incumbent workers and are available nationally. (Most teacher-developed standards tend to be more related to the delivery of instruction than to occupationally related tasks.)

A list of the sources for the standard must be listed for each performance objective. An entire bibliography of sources must be included in every catalog in the appendix section.

2. Write the performance guides.

Once decisions have been made as to those tasks for which objectives will be written, it is necessary to record the steps involved in performing each task.

The series of steps, when followed sequentially, resulting in the successful completion of a given task, are defined as performance guides.

The incumbent worker is used as the expert in identifying the steps and recommending the sequence.

> **NOTE: Format and editing should not be the main focus at this point in the process. Refinement can take place after the draft copy is written.**

Sources for writing the steps of the performance guides include the current job experiences of the writing team member(s), worker interviews, observations of task performance, and technical literature.

Using a **TASK WORKSHEET*** the following should be performed when developing performance guides.

a. Identify the task(s) and match the task(s) to the duty area statement(s) to ensure continuity of thought among the incumbent workers.

b. Record activities while observing a worker performing the task; concisely, but thoroughly, describe the steps in the worker's language.

c. Locate the starting point and closing point for activities leading to the completion of the task under review.

d. Record those activities in the sequence most commonly followed on the job.

e. Note personal safety precautions involved in the activity.

f. Avoid recording a detailed explanation of the performance steps.

g. Avoid recording explanations of the expected results of the task performance.

h. Begin each step of the performance guide with an action verb.

---

* See example, page 72.

i. Identify the tools, equipment, and work aids needed to complete the action requirements as outlined in the performance steps. (Use the tools, equipment, and work-aids list as a resource for developing the condition of the performance objective and as a check against the generic tools, equipment, and work-aids list provided in the occupational inventory.)

j. Critique each step of the performance guide.

NOTE: Performance guides should reflect what one would see happening and should not include comments of an instructional nature. In this way, performance guides serve as outlines from which instructional materials can be developed with maximum flexibility.

k. References that may help

. For task detailing, consult --

Robert F. Mager and Kenneth M. Beach, Jr., Developing Vocational Instruction, pp. 16-24. Belmont, CA: Fearon Publishers, Inc.

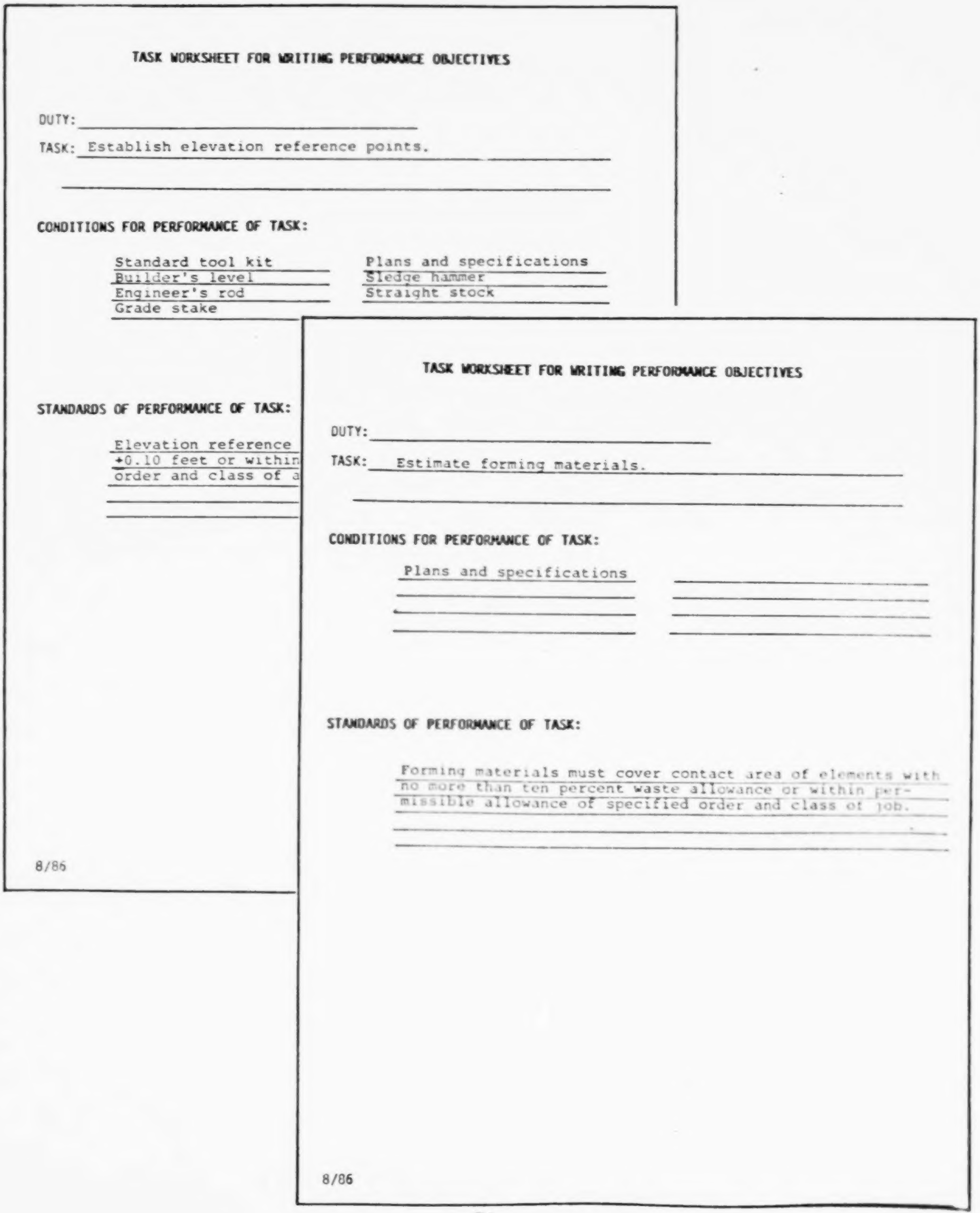
. For guide procedures, consult --

Indiana's Task Analysis Guides Procedures. Indianpaolis, IN: (1811 Executive Drive, Suite D).

. For element identification, consult --

Interservice Procedures for Instructional Systems Development, "Phase I: Analyze," pp. 17-24. NAVEDTRA 106A, August 1, 1975.

EXAMPLE TASK WORKSHEET
FOR WRITING PERFORMANCE OBJECTIVES



TASK WORKSHEET FOR WRITING PERFORMANCE OBJECTIVES

DUTY: __________

TASK: Establish elevation reference points.

CONDITIONS FOR PERFORMANCE OF TASK:

Standard tool kit	Plans and specifications
Builder's level	~~Sledge hammer~~
Engineer's rod	Straight stock
Grade stake	

STANDARDS OF PERFORMANCE OF TASK:

Elevation reference
±0.10 feet or within
order and class of a

8/86

TASK WORKSHEET FOR WRITING PERFORMANCE OBJECTIVES

DUTY: __________

TASK: Estimate forming materials.

CONDITIONS FOR PERFORMANCE OF TASK:

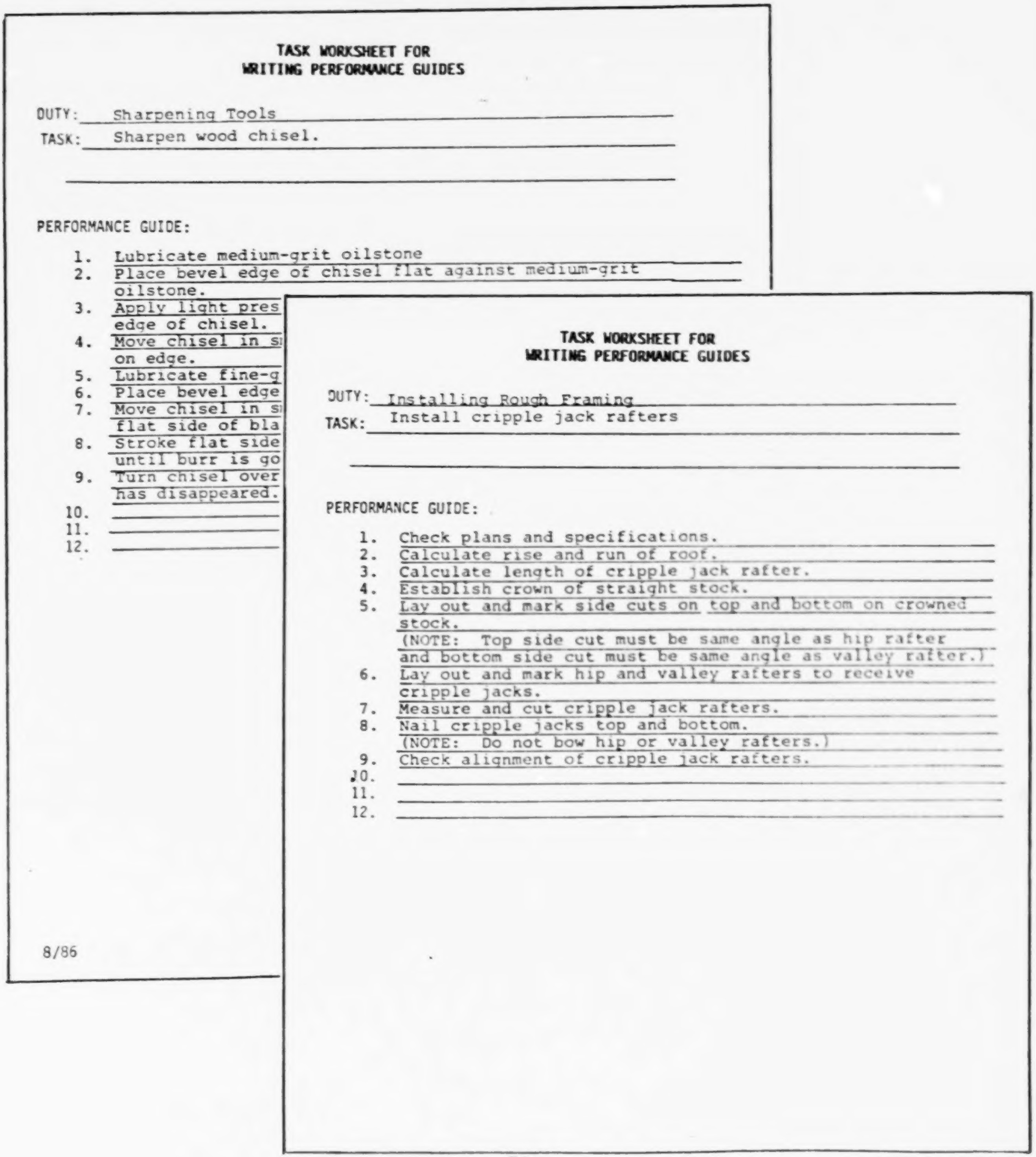
Plans and specifications

STANDARDS OF PERFORMANCE OF TASK:

Forming materials must cover contact area of elements with no more than ten percent waste allowance or within permissible allowance of specified order and class of job.

8/86

EXAMPLE TASK WORKSHEET
FOR WRITING PERFORMANCE GUIDES



TASK WORKSHEET FOR
WRITING PERFORMANCE GUIDES

DUTY: Sharpening Tools
TASK: Sharpen wood chisel.

PERFORMANCE GUIDE:

1. Lubricate medium-grit oilstone
2. Place bevel edge of chisel flat against medium-grit oilstone.
3. Apply light pres
edge of chisel.
4. Move chisel in s
on edge.
5. Lubricate fine-g
6. Place bevel edge
7. Move chisel in s
flat side of bla
8. Stroke flat side
until burr is go
9. Turn chisel over
has disappeared.
10.
11.
12.

8/86

TASK WORKSHEET FOR
WRITING PERFORMANCE GUIDES

DUTY: Installing Rough Framing
TASK: Install cripple jack rafters

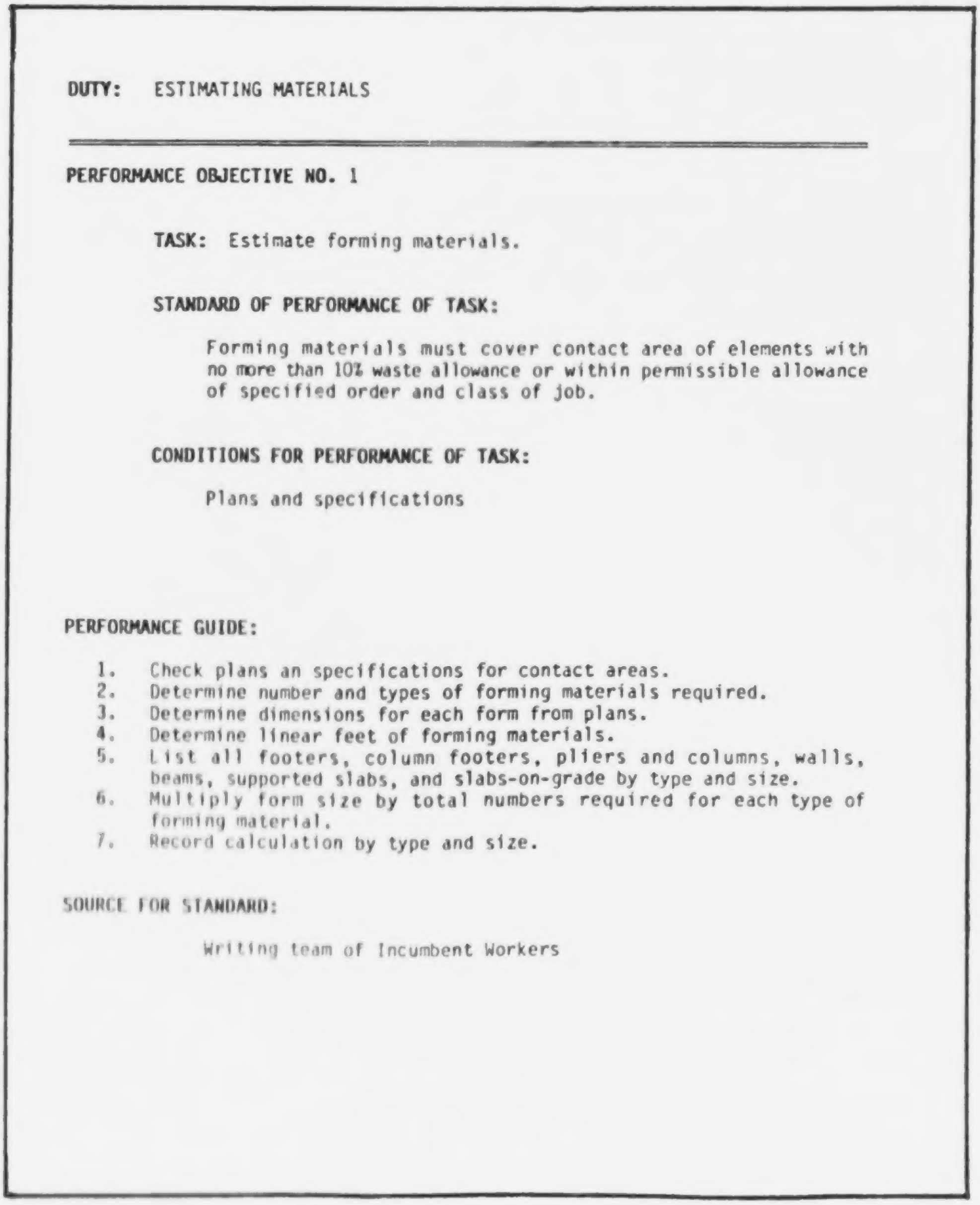
PERFORMANCE GUIDE:

1. Check plans and specifications.
2. Calculate rise and run of roof.
3. Calculate length of cripple jack rafter.
4. Establish crown of straight stock.
5. Lay out and mark side cuts on top and bottom on crowned stock.
(NOTE: Top side cut must be same angle as hip rafter and bottom side cut must be same angle as valley rafter.)
6. Lay out and mark hip and valley rafters to receive cripple jacks.
7. Measure and cut cripple jack rafters.
8. Nail cripple jacks top and bottom.
(NOTE: Do not bow hip or valley rafters.)
9. Check alignment of cripple jack rafters.
10.
11.
12.

3. Type Catalog Pages.

After the **TASK WORKSHEETS** are completed and refined for each task, the V-TECS catalog pages are word processed. See example catalog page below.

EXAMPLE CATALOG PAGE FORMAT



DUTY: ESTIMATING MATERIALS

PERFORMANCE OBJECTIVE NO. 1

TASK: Estimate forming materials.

STANDARD OF PERFORMANCE OF TASK:

Forming materials must cover contact area of elements with no more than 10% waste allowance or within permissible allowance of specified order and class of job.

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications

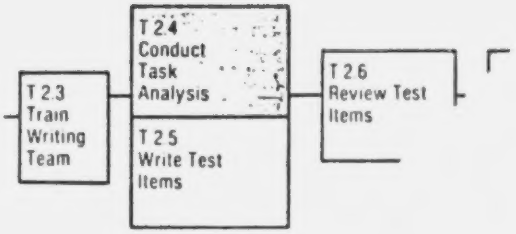
PERFORMANCE GUIDE:

1. Check plans an specifications for contact areas.
2. Determine number and types of forming materials required.
3. Determine dimensions for each form from plans.
4. Determine linear feet of forming materials.
5. List all footers, column footers, pliers and columns, walls, beams, supported slabs, and slabs-on-grade by type and size.
6. Multiply form size by total numbers required for each type of forming material.
7. Record calculation by type and size.

SOURCE FOR STANDARD:

Writing team of Incumbent Workers

T 2.4 CONDUCT TASK ANALYSIS



A **task analysis** is a procedure that identifies the supporting knowledge and subskills, and the related safety and employability skills necessary to accomplish a task.*

The outcome of the task analysis shows the following.

- Task.
- Performance objective.
- A breakdown of task into major steps.
- The supporting knowledge and subskills for each step.
- Work attitudes and employability skills, including safety practices related to the task.
- The relationship among the skills, subskills, supporting knowledge, and attitudes.
- The tools, materials, and equipment necessary to perform the task.

Task analysis is used as the basis for writing test items.

- The "knowledge" components are the basis for written test items in the cognitive domain.
- The "skill" components are the basis for task performance as well as test items relating to performance of the task.

---

* Hoffman, Cynthia K., and Medsker, Karen L. "Instructional Analysis: The Missing Link Between Task Analysis and Objective," Journal of Instructional Development, vol. 6, no. 4, 1983, pp. 17-23.

The Procedure

1. **Using the V-TECS catalog of performance objectives and performance guides, arrange the V-TECS tasks within a duty area in a logical order so that relationships among them are clear.** For example, some tasks are basic or are prerequisite skills that other tasks are built on, and should be placed first. (Start with the most basic task within the duty area.)

2. **List major performance steps of the task.**

3. **Analyze each step, asking these critical questions --**

   a. What does the student need to know to do this step? Knowledge cannot be observed, but must be applied as a form of reasoning or recall. Below are examples which show how the task, performance steps, and what the student has to "know" are related.

Task: Replace a defective switch.

Performance Step: 1. Determine if switch is defective.

Know: 1. a. Operation of the Ohmmeter.
b. Principles of a circuit.

Performance Step: 2. Install a new switch.

Know: 2. a. Tools and how to use them.
b. Wire color codes.

Task: Key from rough-draft copy.

Performance Step: 1. Edit rough-draft copy.

Know: 1. a. Proofreader's symbols.
b. English skills.

Performance Step: 2. Key copy from rough draft.

Know: 2. a. Machine manipulation.
b. Format rules.

This list may be used as a means of identifying knowledges required to perform a task.

-- Is knowledge of terminology required?
-- Is knowledge of component location or integral parts required?
-- Is knowledge of the operation of tools and equipment required?
-- Is the interpretation of symbols or signals necessary?
-- Are calculations performed?
-- Are the techniques of problem-solving, diagnosis, and trouble-shooting required?
-- Is the anticipation of later conditions from observation of earlier conditions required?
-- Is planning involved?
-- Is the selection of strategies involved?
-- Must the task be performed in accordance with briefing instructions?
-- Is knowledge of the "why" of a procedure essential?

b. What does the student need to do to complete this step? A "do" skill is a manipulative action or a manual behavior that can be observed. Below are examples that show how the task, performance steps, and what the student has to "do" are related.

Task: Replace a defective switch.

Performance Step: 1. Determine if the switch is defective.

Do: 1. Check for continuity across terminals --
   a. Calibrate Ohmmeter.
   b. Hook up leads.
   c. Take a reading.

Performance Step: 2. Install new switch.

Do: 2. a. Remove defective switch --
      (1) Disconnect wires.
      (2) Disconnect fasteners.

   b. Install new switch --
      (1) Fasten switch
      (2) Fasten wires.

Task: Key from rough-draft copy.

Performance Step: 1. Edit rough-draft copy.

Do: 1. a. Read through rough-draft copy.
   b. Correct punctuation, spelling, and grammar.

Performance Step: 2. Key copy from rough draft.

Do: 2. Key copy in specified format.

This list of questions may be used as a means for identifying the "do" skills for performing a task.

- -- What are the students required to do with their hands?
- -- Do the students have to perform this activity at awkward angles or in unusual locations? (Is balance involved, such as climbing a ladder?)
- -- Does performance of this step involve unusually strenuous activity? (Do the students have to lift or move weight?)
- -- Does performance of this activity require especially fine motor coordination? (Is critical welding involved? Are the students mixing potentially explosive chemicals?)
- -- Does performance require especially fine senses of touch (heat or cold), hearing (steam leaks), sight (oil leaks, distance), or smell (ammonia leaks)?

c. What safety skills and employability skills does the student have to perform? A task may or may not include these skills, but adhering to safety rules is absolutely essential when performing potentially dangerous activity and, therefore, must be included in the task analysis. Here is an example.

Task: Replace a defective switch.
Do: Check for continuity across terminals.
Safety: Disconnect the power.

Other steps often include employability skills which involve seeking, obtaining, keeping and advancing in a job. Here is an example of an employability skill.

Task: Receive telephone calls.
Employability Skills: a. Answer promptly.
b. Speak courteously.

4. **Refer to the V-TECS catalog and list the necessary tools, equipment, and materials necessary to perform the task.**

5. **List related attitudes that support the task.**

6. **Review analysis with subject matter experts and revise as necessary.**

7. **Identify types of test items to be written for each task.***

    - Written test items should be considered for the "knowledge" components identified in the task analysis and for safety and employability skills.
    - Performance test items (with process and/or product checklists) should be considered for the "do" components identified in the task analysis and for safety and employability skills.

---

* See example task analysis, page 134.

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Writing and Reviewing Test Items: Multiple Choice, Matching, Performance

Presented
by

Ora Kromhout
Florida

Tuesday, April 12
8:30 am - 9:30 am

11:15 am - 12:15 pm

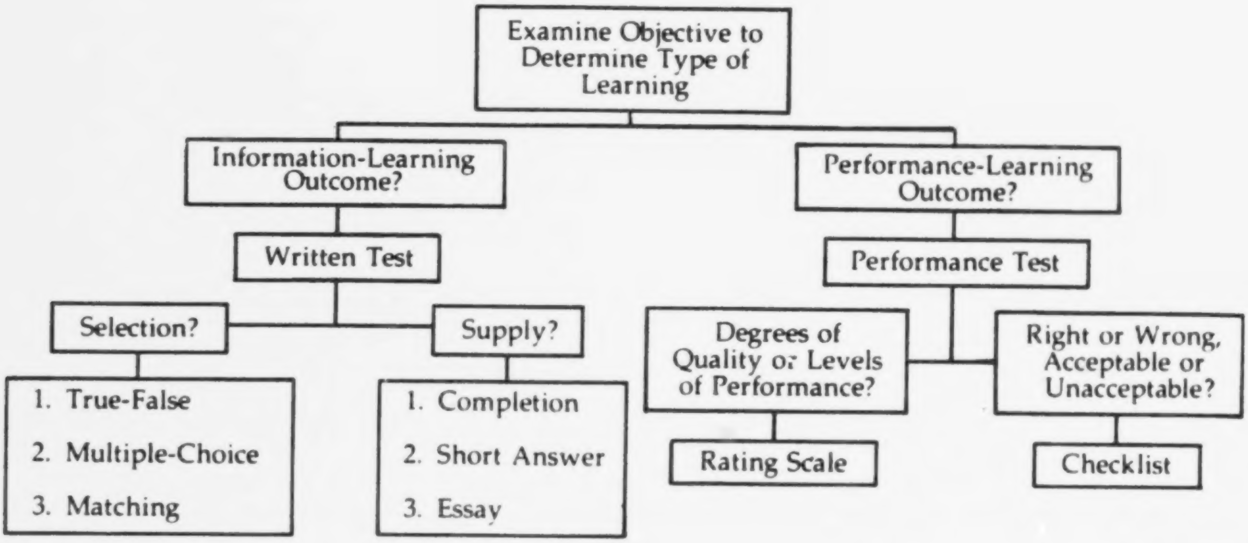
Wednesday, April 13
8:30 am - 9:30 am

Instruction

Objectives

Tests

Determining the Appropriate Type of Test to Use*


Examine Objective to Determine Type of Learning
Information-Learning Outcome?
Performance-Learning Outcome?
Written Test
Performance Test
Selection?
Supply?
1. True-False
2. Multiple-Choice
3. Matching
1. Completion
2. Short Answer
3. Essay
Degrees of Quality or Levels of Performance?
Right or Wrong, Acceptable or Unacceptable?
Rating Scale
Checklist

*From Criterion-Referenced Testing: A Component of the FACIT System, Florida Department of Education, 1980.

MULTIPLE-CHOICE ITEM TERMINOLOGY

DISPLAY

DECONGESTANT

Adults:	2 tablets every 6 hours	
Children:	6 to 12 years:	1 tablet every 4 hours
	2 to 5 years:	1/2 tablet every 4 hours
	Under 2 years:	Consult your doctor

ITEM SET

	STEM	How much should you give your nine-year-old child?
OPTIONS	DISTRACTOR	A. 1/2 tablet every 4 hours
	KEY	B. 1 tablet every 4 hours
	DISTRACTORS	C. 2 tablets every 6 hours D. consult your doctor
	STEM	What is the largest number of tablets an adult can take in a 24-hour period?
OPTIONS	DISTRACTORS	A. 2 tablets B. 6 tablets
	KEY	C. 8 tablets
	DISTRACTOR	D. 12 tablets

KEY WORDS

ITEM
- Measures
- Accurate
- Level
- Clear
- Bias
- Important
- Difficulty
- Format
- Positive
- Absolutes
- Independent

DISPLAY
- Limited
- Necessary

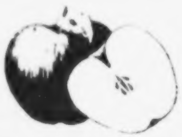
OPTIONS
- Four Options
- One Answer
- Plausible
- Logical
- Order
- No "All or None"
- No True-False

STEM
- Complete
- Pertinent
- Concise

CLUES
- Position
- Associations
- Agree
- Parallel
- Length

SAMPLE ITEM QUESTION FORMAT

Display



Stem { What type of fruit does the picture represent? ← Use a question mark

Options {
A. aggregate
B. berry
C. drupe
*D. pome

} Distractors (A–C)
} Correct answer (D)

Star Answer — Capital letters — Small letters in alphabetical order — No periods

© State of Florida, Department of State, 1987

These workshops were designed and developed by
The Center for Instructional Development and Services
College of Education
Florida State University

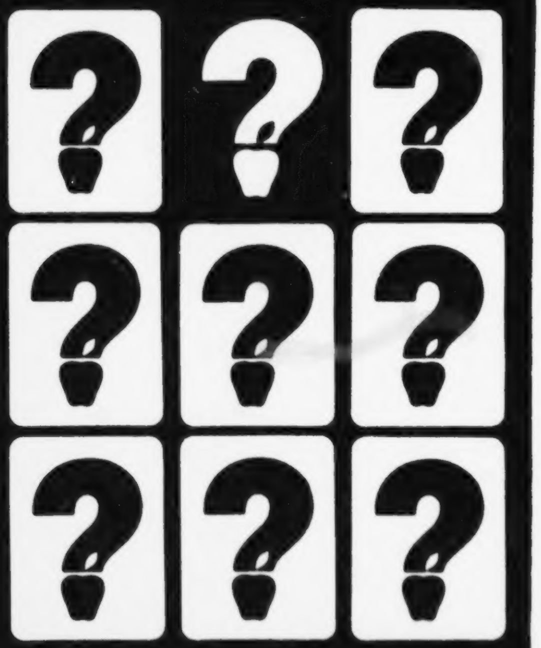
Sponsored by
Florida Department of Education
Betty Castor, Commissioner

For additional information call a testing specialist at
1-800-428-1194, Suncom 277-2054, or (904) 487-2054.

State of Florida
Department of Education
Tallahassee, Florida
Betty Castor, Commissioner
Affirmative action/equal opportunity employer

DVACE 10-87-500 12345678 8987

TEST DEVELOPMENT



READY REFERENCE

BEST COPY AVAILABLE

ITEM

KEY WORDS	Make sure the whole item
MEASURES	Measures a predefined subskill or objective from the student performance standard
ACCURATE	Has content that is accurate and up-to-date
LEVEL	Addresses the desired cognitive level; e.g., recall, application, or problem solving
CLEAR	Is written clearly, using straightforward vocabulary and sentence structure. Avoid using slashes or and/or constructions.
BIAS	Avoids gender, cultural, and age bias.
IMPORTANT	Has content that is critically important or frequently used. Avoid nice-to-know, trivial, or rote-memory items. Avoid lifting items straight from written text.
DIFFICULTY	Has a difficulty (content, math, or reading) level appropriate for the target group and purpose of the test. Avoid "tricky" or uncommon technical language, invented words, and false information.
FORMAT	Has stem and response formats consistent with the project specifications.
POSITIVE	Is stated positively, avoiding not, except, etc. If stated negatively, the negative word is CAPITALIZED.
ABSOLUTES	Avoids using absolute words such as always, only, and never.
INDEPENDENT	Is independent, i.e., one item doesn't have to be completed before answering other items. Nor does one item help or hinder answering other items.

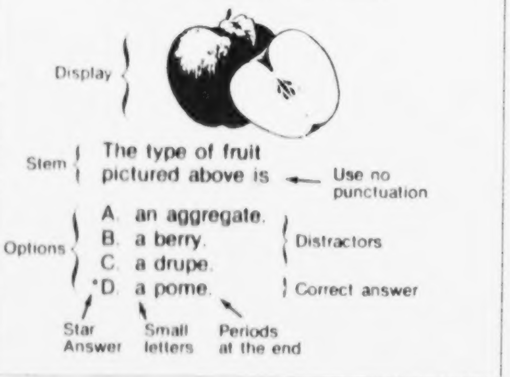
DISPLAY

KEY WORDS	Make sure the display
LIMITED	Is limited to use with no more than five corresponding questions
NECESSARY	Is necessary for answering every display linked item

STEM

KEY WORDS	Make sure the stem of the item
COMPLETE	Is a complete statement of the question or problem. A content expert should be able to answer the item without seeing the options.
PERTINENT	Only contains information pertinent to the question or problem, unless it is used for a specific purpose.
CONCISE	Is as concise and brief as possible.

SAMPLE ITEM
COMPLETION FORMAT



OPTIONS

KEY WORDS	Make sure the options
FOUR OPTIONS	For multiple choice items have one correct answer and three distractors, i.e., four options.
ONE ANSWER	Exhibit only one correct or "best" answer that can be agreed upon by content experts.
PLAUSIBLE	Have plausible and attractive distractors representing common errors.
LOGICAL ORDER	Are arranged in logical order, if possible; i.e., numerical, alphabetical, chronological.
NO "ALL OR NONE"	Avoid "all of the above" or "none of the above" unless it is used for a specific purpose. Use it sparingly and randomly for both correct and incorrect answers.
TRUE-FALSE	For multiple choice items are not simply a list of true-false statements.

CLUES

KEY WORDS	Don't give clues
POSITION	Vary the position of the correct answer in the sequence of the options throughout the test.
ASSOCIATIONS	Don't provide common verbal associations to or repetitions of words that are in the stem.
AGREE	Make options agree grammatically and conceptually with the stem, to avoid easy elimination of distractors.
PARALLEL	Make options grammatically and conceptually similar or parallel.
LENGTH	Make option lengths similar and as brief as possible. Longer options are often the correct answer.

DOMAINS OF KNOWLEDGE

(COGNITIVE, SIMPLIFIED)

COGNITIVE LEVEL 1 -- Recall, Verbal Information

Includes "knowing":

- Names and labels
- Facts
- Terminology
- Definitions
- Procedures and methods
- Stated rules

COGNITIVE LEVEL 2 -- Application of Knowledge

Includes:

- Using formulas
- Interpreting charts, graphs, diagrams
- Classifying (objects, concepts)
- Using rules (selecting appropriate rules) to solve problems
- Applying rules to specific situations or conditions
- Solving "paper & pencil" problems (word problems, puzzles)
- Solving "hands-on" problems (diagnosing, trouble shooting, debugging)
- Analyzing (comparing, contrasting, distinguishing)
- Evaluating (judging, assessing)
- Synthesizing (designing, planning, organizing)

TEST BLUEPRINT WORKSHEET

Vocational Program____

Intended Outcomes **Weight/Percent**

Total 100%

TEST ITEM WORKSHEET FOR MULTIPLE-CHOICE ITEMS

Item ID #:

Vocational Program:

Catalog Title:

Duty Area:

Task:

Objective **/Number:**

Domain (Circle one): Cognitive, Level One (Recall)
Cognitive, Level Two (Application)

Source, or written by:

Stem (Question or problem presented):

(Note: Attach any needed artwork.)

Options (Correct response and distractors)

A.

B.

C.

D.

(Correct response is indicated by an *.)

TEST ITEM WORKSHEET FOR MATCHING ITEMS

Duty Area ___ ______________________

Task ___ ______________________

____

____

Written by ______________________ **or Source*** ______________

Reviewed by ______________________

(Sample directions: Match the ______________ (List 1) with ______________ (List 2).)

______________________	______________________
(name of List 1)	(name of List 2)
1.	a.
2.	b.
3.	c.
4.	d.
5.	e.
6.	f.
	g.
	h.

NOTE: List 2 should have more items than List 1

*Give source referance data on back

71

TEST ITEM WORKSHEET
FOR PERFORMANCE ITEMS

ITEM ID #:

TEST ITEM WORKSHEET FOR PERFORMANCE ITEMS

. VOCATIONAL PROGRAM:

CATALOG TITLE:

DUTY AREA:

TASK:

Objective /NUMBER:

Written by :
or Source:

PERFORMANCE OBJECTIVE:

REQUIRED BY ITEM:

Equipment	Supplies	Materials

TEST ITEM WORKSHEET
FOR PERFORMANCE ITEMS *(continued)*

DIRECTIONS FOR INSTRUCTOR/EVALUATOR:

DIRECTIONS TO STUDENT:

SCORING CRITERIA

a. Process Steps:

VALIDATION COMMITTEE RESPONSE FORM

Reviewer's Name: ______________________________

Subject: ______________________ **Date:** ______________________

Item Number	Correct Answer	Comments

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Managing the Development of a Computerized Test Item Bank

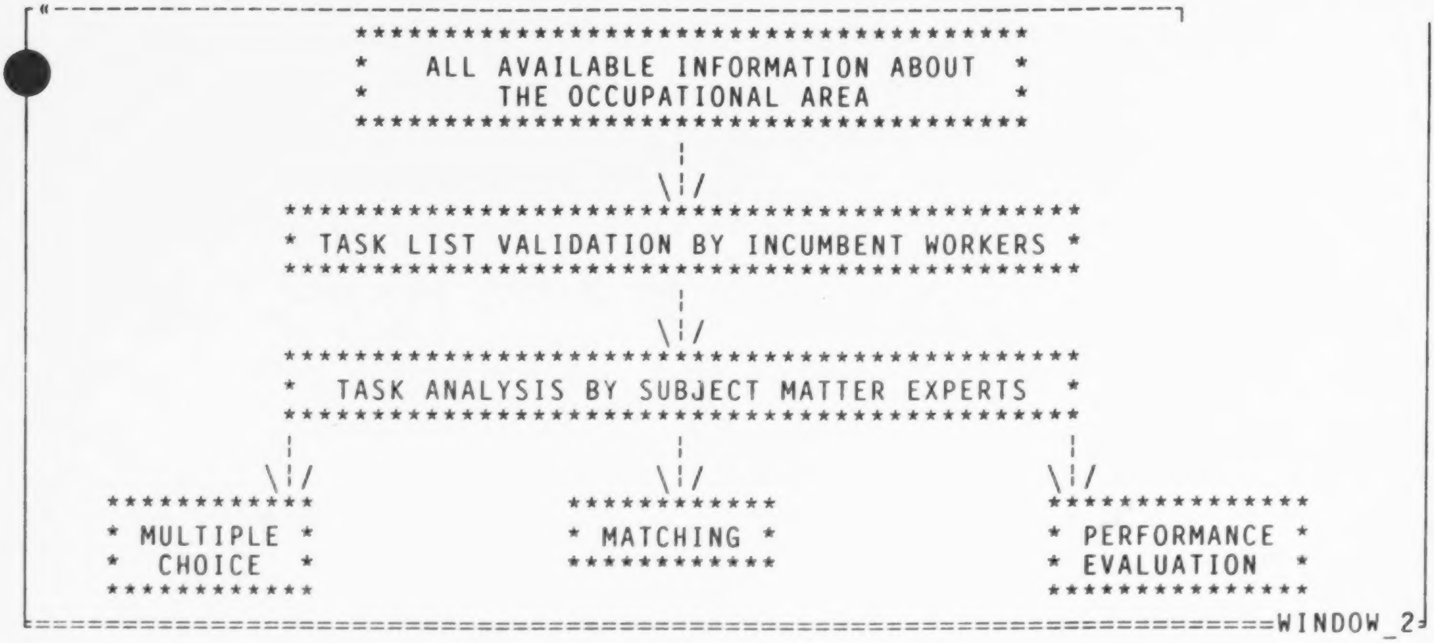
Presented
by

Fred Reneau
Illinois

Tuesday, April 12

8:30 am - 9:30 am
10:00 am - 11:00 am
11:15 am - 12:15 pm

MANAGING THE DEVELOPMENT
OF A
COMPUTERIZED TEST ITEM BANK



```
                    **************************************
                    *   ALL AVAILABLE INFORMATION ABOUT  *
                    *       THE OCCUPATIONAL AREA        *
                    **************************************
                                    |
                                   \|/
                ********************************************
                * TASK LIST VALIDATION BY INCUMBENT WORKERS *
                ********************************************
                                    |
                                   \|/
                ********************************************
                *  TASK ANALYSIS BY SUBJECT MATTER EXPERTS  *
                ********************************************
                |                   |                      |
               \|/                 \|/                    \|/
      ************          ************           **************
      * MULTIPLE *          * MATCHING *           * PERFORMANCE *
      *  CHOICE  *          ************           * EVALUATION  *
      ************                                 **************
==================================================================WINDOW_2
```

```
┌--------A----------B-------C---D-----E---------F-----GH---I-------J-------┐
70
 
72
73
74  CATALOG#    DUTY AREA PO #     UNIQUE#
75  IL014C      C         043      00003
76  IL014C      D         080      00004
77  IL014C      D         098      00005
78  IL014C      C         043      00002
79  IL014C      C         040      00001
80
81
82
83
84
85
86
87
88
89
└=====================================================================WINDOW_3┘
```

FORM

```
┌---------------------------------------------------------------------------------┐
|                               MULTIPLE CHOICE                                    |
|Catalog# IL014C   State IL    Date 0388    Item type MC    Duty area __            |
|Task number ___   Domain __   Graphics _   Answer _____    Unique# ______          |
|STEM ____________________________________________________________               |
|STEM cont ____________________________________________________________           |
|OPTION A ____________________________________________________________            |
|OPTION B ____________________________________________________________            |
|OPTION C ____________________________________________________________            |
|OPTION D ____________________________________________________________            |
|OPTION E ____________________________________________________________            |
|                                                                                  |
|                                                                                  |
|                                                                                  |
|                                                                                  |
|                                                                                  |
|                                                                                  |
|                                                                                  |
|                                                                                  |
|                                                                                  |
└MC========================================================================WINDOW_4┘
```

```
┌-----------------------------------------------------------------------------------┐
|                                MULTIPLE CHOICE                                    |
|Catalog# ______    State __    Date ____    Item type __    Duty area __           |
|Task number ___    Domain __   Graphics _   Answer _____    Unique# ______         |
|STEM ____________________________________________________________                  |
|STEM cont ____________________________________________________________             |
|OPTION A ____________________________________________________________              |
|OPTION B ____________________________________________________________              |
|OPTION C ____________________________________________________________              |
┌-----------------------------------------------------------------------------------┐
|                                MULTIPLE CHOICE                                    |
|Catalog# IL014C    State IL    Date 0388    Item type MC    Duty area C_           |
   sk number 040    Domain C2   Graphics 0   Answer B____    Unique# 00001_         |
|STEM If a stock plant purchased March 1st will yield 9-10 cutting                  |
|STEM cont ____________________________________________________________             |
|OPTION A 15 - 17____________________________________________________               |
|OPTION B 20 - 22____________________________________________________               |
|OPTION C 25 - 27____________________________________________________               |
|OPTION D 30 - 32____________________________________________________               |
|OPTION E ____________________________________________________________              |
|                                                                                   |
└MC==============================================================WINDOW_5┘
```

```
                                                                                 SHEET

┌--------------------------------------------------------------------------------┐
|DUTY AREA   TASK NUMBER   ANSWER UNIQUE#   STEM                                 |
|C           043           A      00003     A single seedling should be held by  |
|C           043           D      00002     Germination of most seeds require al|
|C           040           B      00001     If a stock plant purchased March 1st|
|D           098           A      00005     Broadleaf weeds are also called?     |
|D           080           B      00004     Hedges hould be sheared so that the:|
|                                                                                |
|                                                                                |
|                                                                                |
|                                                                                |
|                                                                                |
|                                                                                |
|                                                                                |
|                                                                                |
|                                                                                |
|                                                                                |
|                                                                                |
|                                                                                |
|                                                                                |
└===========================================================================WINDOW_6┘
```

```
┌-----------------------------------------------------------------------------┐
|DUTY AREA   TASK NUMBER   ANSWER UNIQUE#  STEM                               |
|C           043            A      00003    A single seedling should be held by |
|C           043            D      00002    Germination of most seeds require al|
|C           040            B      00001    If a stock plant purchased March 1st|
|D           098            A      00005    Broadleaf weeds are also called?    |
|D           080            B      00004    Hedges hould be sheared so that the:|
┌-----------------------------------------------------------------------------┐
|DUTY AREA   TASK NUMBER   ANSWER UNIQUE#  STEM                               |
|C           040           B       00001    If a stock plant purchased March 1st |
|C           043           A       00003    A single seedling should be held by t|
|C           043           D       00002    Germination of most seeds require all|
|D           080           B       00004    Hedges hould be sheared so that the: |
|D           098           A       00005    Broadleaf weeds are also called?     |
└=============================================================WINDOW_7┘
|                                                                     |
|                                                                     |
|                                                                     |
|                                                                     |
|                                                                     |
|                                                                     |
└-------------------------------------------------------------WINDOW_6┘
```

SHEET

```
 ---------------------------------------------------------------------------┐
|DUTY AREA   TASK NUMBER   ANSWER UNIQUE#   STEM                            |
|C           043            A       00003   A single seedling should be held by |
|C           043            D       00002   Germination of most seeds require al|
|C           040            B       00001   If a stock plant purchased March 1st|
|D           098            A       00005   Broadleaf weeds are also called?    |
|D           080            B       00004   Hedges hould be sheared so that the:|
┌---------------------------------------------------------------------------┐
|DUTY AREA  TASK NUMBER   ANSWER UNIQUE#   STEM                             |
|C          040           B       00001    If a stock plant purchased March 1st |
|C          043           A       00003    A single seedling should be held by t|
|C          043           D       00002    Germination of most seeds require all|
|D          080           B       00004    Hedges hould be sheared so that the: |
|D          098           A       00005    Broadleaf weeds are also called?     |
┌---------------------------------------------------------------------------┐
|DUTY AREA  TASK NUMBER   ANSWER UNIQUE#   STEM                             |
|C          040           B       00001    If a stock plant purchased March 1st |
|C          043           D       00002    Germination of most seeds require all|
|C          043           A       00003    A single seedling should be held by t|
|D          080           B       00004    Hedges hould be sheared so that the: |
|D          098           A       00005    Broadleaf weeds are also called?     |
└=====================================================================WINDOW7A┘
```

```
Editing Record 1 of 6 (1 Match)                                              FORM

 -------------------------------------------------------------------------------┐
|                              MULTIPLE CHOICE                                  |
|Catalog# IL014C   State IL    Date 0388    Item type MC    Duty area C_        |
|Task number 040   Domain C2   Graphics 0   Answer B____    Unique# 00001_      |
|STEM If a stock plant purchased March 1st will yield 9-10 cutting              |
|STEM cont ______________________________________________________               |
|OPTION A 15 - 17________________________________________________               |
|OPTION B 20 - 22________________________________________________               |
|OPTION C 25 - 27________________________________________________               |
|OPTION D 30 - 32________________________________________________               |
|OPTION E _______________________________________________________               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
└MC=============================================================WINDOW_8┘
```

TEST ITEM PRINTOUT FOR FIELD TEST

1. A single seedling should be held by the:

   A. cotyledons.

   B. hypocotyl.

   C. radical.

   D. epicotyl.

WINDOW_9

DOC

TEST ITEM PRINTOUT FOR FIELD TEST (WITH ANSWERS)

A single seedling should be held by the:

A. cotyledons.

B. hypocotyl.

C. radical.

D. epicotyl.

ANSWER = A

WINDOW10

TEST ITEM ASCII FILE TO ODAS

IL014CIL1087MCC047C10A00001

A single seedling should be held by the:

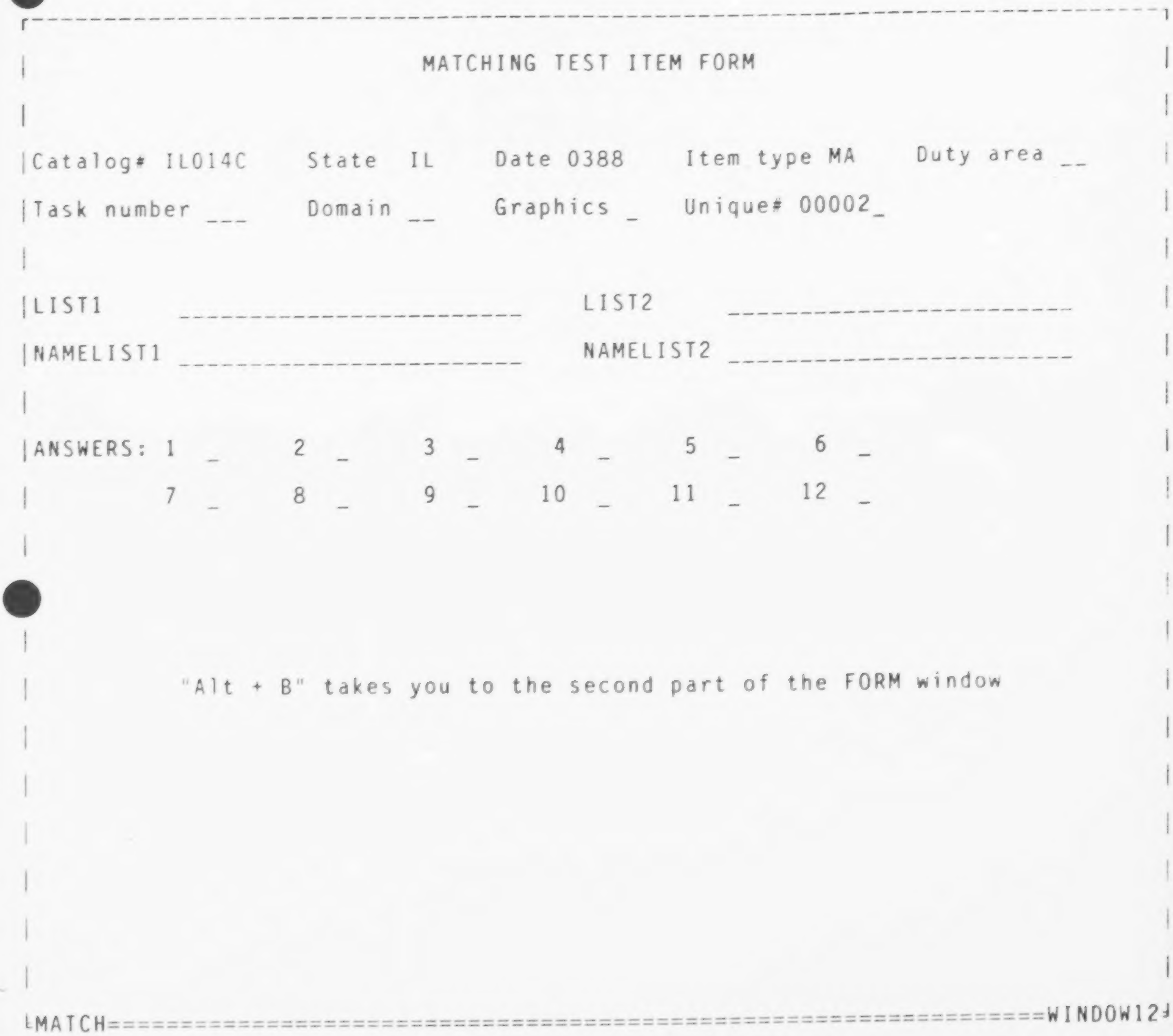
A. cotyledons.

B. hypocotyl.

C. radical.

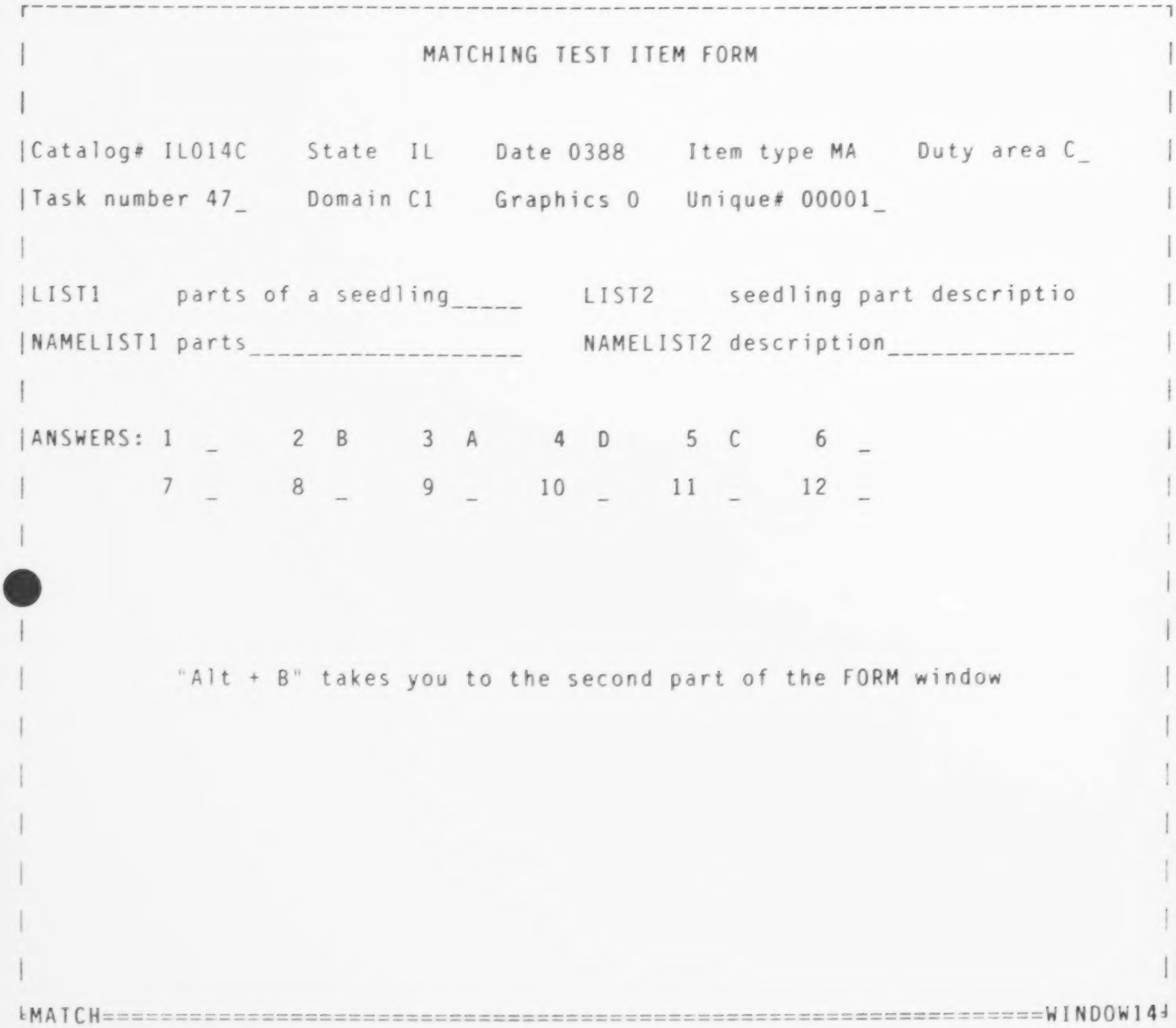
D. epicotyl.

WINDOW11



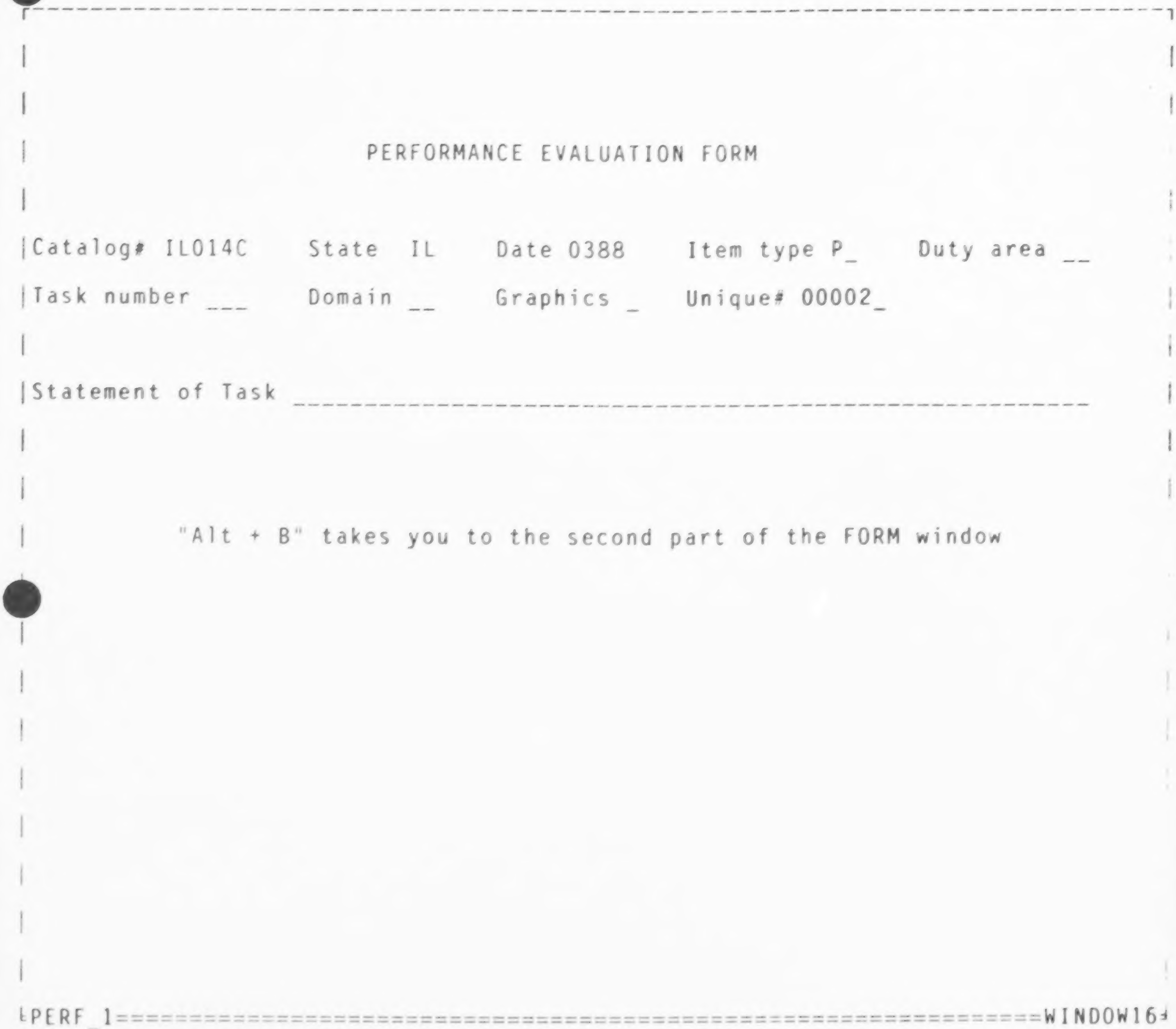
```
                         MATCHING TEST ITEM FORM

Catalog# IL014C    State  IL    Date 0388    Item type MA    Duty area __
Task number ___    Domain __    Graphics _   Unique# 00002_

LIST1      ________________________    LIST2     ________________________
NAMELIST1  ________________________    NAMELIST2 ________________________

ANSWERS: 1  _    2  _    3  _    4  _    5  _    6  _
         7  _    8  _    9  _   10  _   11  _   12  _



          "Alt + B" takes you to the second part of the FORM window







MATCH================================================================WINDOW12
```

```
┌-----------------------------------------------------------------------------┐
|MATCHING                                Unique# 00001                        |
|LIST #1                                                                      |
|                                                                             |
|  1 ______________________________      2 ______________________________     |
|  3 ______________________________      4 ______________________________     |
|  5 ______________________________      6 ______________________________     |
|  7 ______________________________      8 ______________________________     |
|  9 ______________________________     10 ______________________________     |
| 11 ______________________________     12 ______________________________     |
|                                                                             |
|                                                                             |
|MATCHING              "ALT + A" takes you back to the first part.           |
|LIST #2                                                                      |
|                                                                             |
| A ______________________________       B _____________________________      |
| C ______________________________       D ______________________________     |
| E ______________________________       F ______________________________     |
| G ______________________________       H ______________________________     |
| I ______________________________       J ______________________________     |
| K ______________________________       L ______________________________     |
└MATCH2=======================================================WINDOW13┘
```



```
                         MATCHING TEST ITEM FORM

Catalog# IL014C    State  IL    Date 0388    Item type MA    Duty area C_
Task number 47_    Domain C1    Graphics 0   Unique# 00001_

LIST1     parts of a seedling_____     LIST2     seedling part descriptio
NAMELIST1 parts___________________     NAMELIST2 description_____________

ANSWERS: 1  _     2  B     3  A     4  D     5  C     6  _
         7  _     8  _     9  _    10  _    11  _    12  _



         "Alt + B" takes you to the second part of the FORM window

MATCH===========================================================WINDOW14
```

```
┌------------------------------------------------------------------------┐
|MATCHING                               Unique# 00001                    |
|LIST #1                                                                 |
|                                                                        |
|  1 In most cases, does not look l      2 Looks like the leaves of the j |
|  3 Looks like the roots of the pl      4 Looks like the stem of the pla |
|  5 ______________________________      6 ______________________________ |
|  7 ______________________________      8 ______________________________ |
|  9 ______________________________     10 ______________________________ |
| 11 ______________________________     12 ______________________________ |
|                                                                        |
|                                                                        |
|MATCHING           "ALT + A" takes you back to the first part.          |
|LIST #2                                                                 |
|                                                                        |
| A true leaves___________________       B cotyledons___________________ |
| C hypocotyl_____________________       D radical______________________ |
| E epicotyl______________________       F ______________________________ |
| G ______________________________       H ______________________________ |
| I ______________________________       J ______________________________ |
| K ______________________________       L ______________________________ |
└MATCH2=================================================================WINDOW15┘
```



```
                    PERFORMANCE EVALUATION FORM

Catalog# IL014C    State  IL    Date 0388    Item type P_    Duty area __
Task number ___    Domain __    Graphics _   Unique# 00002_

Statement of Task _____________________________________________________


        "Alt + B" takes you to the second part of the FORM window

PERF_1==========================================================WINDOW16
```

```
┌--------------------------------------------------------------------------┐
|PROCESS                              Unique# 00002                         |
|LIST #1                                                                    |
|                                                                           |
| PC-1   ____________________________   PC-2   ____________________________ |
| PC-3   ____________________________   PC-4   ____________________________ |
| PC-5   ____________________________   PC-6   ____________________________ |
| PC-7   ____________________________   PC-8   ____________________________ |
| PC-9   ____________________________   PC-10  ____________________________ |
| PC-11  ____________________________   PC-12  ____________________________ |
|                                                                           |
|                                                                           |
|PRODUCT           "ALT + A" takes you back to the first part.              |
|LIST #2                                                                    |
|                                                                           |
| PD-1   ____________________________   PD-2   ____________________________ |
| PD-3   ____________________________   PD-4   ____________________________ |
| PD-5   ____________________________   PD-6   ____________________________ |
| PD-7   ____________________________   PD-8   ____________________________ |
| PD-9   ____________________________   PD-10  ____________________________ |
| PD-11  ____________________________   PD-12  ____________________________ |
└PERF_2===========================================================WINDOW17┘
```

```
┌------------------------------------------------------------------------------┐
|                                                                              |
|                                                                              |
|                       PERFORMANCE EVALUATION FORM                            |
|                                                                              |
|Catalog# IL014C    State  IL    Date 0388    Item type P_    Duty area C_     |
|Task number 047    Domain P1    Graphics 0   Unique# 00001_                   |
|                                                                              |
|Statement of Task Prick off seedlings.__________________________________      |
|                                                                              |
|                                                                              |
|         "Alt + B" takes you to the second part of the FORM window            |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
└PERF_1=============================================================WINDOW18┘
```

```
┌----------------------------------------------------------------------┐
|PROCESS                            Unique# 00001                      |
|LIST #1                                                               |
|                                                                      |
| PC-1  Made transplant hole for seedl  PC-2  Removed optimum number of seed  |
| PC-3  Handled groups of seedlings by  PC-4  Handled single seedlings by th  |
| PC-5  Placed seedling in transplant   PC-6  ___________________________  |
| PC-7  ___________________________     PC-8  ___________________________  |
| PC-9  ___________________________     PC-10 ___________________________  |
| PC-11 ___________________________     PC-12 ___________________________  |
|                                                                      |
|                                                                      |
 RODUCT          "ALT + A" takes you back to the first part.           |
|LIST #2                                                               |
|                                                                      |
| PD-1  Medium with optimum moisture c  PD-2  Medium in container not compac  |
| PD-3  Label completed with water pro  PD-4  Plant's species, cultivar, pla  |
| PD-5  Label legible.______________    PD-6  Pricked off seedling survival   |
| PD-7  ___________________________     PD-8  ___________________________  |
| PD-9  ___________________________     PD-10 ___________________________  |
| PD-11 ___________________________     PD-12 ___________________________  |
└PERF_2==========================================================WINDOW19┘
```

TEST ITEMS PRINTOUT

MULTIPLE CHOICE

Select the best response for each multiple choice test item.

_____ 1. A single seedling should be held by the:

A. cotyledons.

B. hypocotyl.

C. radical.

D. epicotyl.

_____ 2. Hedges should be sheared so that the:

A. bottom of the plant is as wide as the top.

B. bottom of the plant is wider than the top.

C. top of the plant is wider than the bottom.

D. top of the plant is longer than it is wide.

_____ 3. Broadleaf weeds are also called?

A. Dicots

B. Grasses

C. Monocots

D. Gymnosperms

MATCHING

Match the description of the seedling with the seedling part.

PARTS

____ 1. In most cases, does not look like the leaves of the juvenile plant.
____ 2. Looks like the leaves of the juvenile plant.
____ 3. Looks like the roots of the plant.
____ 4. Looks like the stem of the plant.

DESCRIPTION

A. true leaves
B. cotyledons
C. hypocotyl
D. radical
E. epicotyl

PERFORMANCE EVALUATION

Use the following information to evaluate the student's performance.

TASK: Prick off seedlings.

PROCESS:	Yes	No
1. Made transplant hole for seedling.		
2. Removed optimum number of seedlings from propagating flat.		
3. Handled groups of seedlings by the leaves or root clumps.		
4. Handled single seedlings by the leaves.		
5. Placed seedling in transplant hole with root tip pointing down.		

PRODUCT:	Yes	No
1. Medium with optimum moisture content.		
2. Medium in container not compacted.		
3. Label completed with water proof instrument.		
4. Plant's species, cultivar, planting date and pricking off date on the label.		
5. Label legible.		
6. Pricked off seedling survival rate is no less than ninety-eight percent.		

```
A>DIR

Volume in drive A has no label
Directory of  A:\

MULTIA1  WR1   80000  11-01-87  12:00p
MULTIB1  WR1   79629   9-28-87  12:00p
MULTIC1  WR1   49512   1-15-88  12:00p
MULTID1  WR1   84315  12-03-87  12:00p
MULTID2  WR1   69040   1-29-88  12:00p
        6 File(s)         0 bytes free

A>
```

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Field Testing Strategies

Presented
by

Barbara Hinton
Arkansas

Tuesday, April 12

2:00 pm - 3:00 pm
3:30 pm - 4:30 pm

Field Testing Strategies:
Student Competency Testing
Arkansas Vocational Technical Education

presented at

The National Conference on Critical Issues in Competency-Based Testing for Vocational-Technical Education

April 11-13, 1988
Opreyland Hotel
Nashville, Tennessee

by

Dr. Barbara E. Hinton
100 Graduate Education Building
University of Arkansas
Fayetteville, AR 72701
Phone (501) 575-4757

Field Testing Strategies: Student Competency Testing

PILOT PROGRAM FIRST YEAR-1986-87

The Division of Vocational and Technical Education, Arkansas Department of Education is committed to Student Competency Testing for secondary and postsecondary vocational education students. During December 1986, the Division conducted a two-day goals setting workshop, during which time *internal participants* (persons who are part of the vocational education delivery system) and *external influentials* (representative of important groups outside the vocational education delivery system) using the nominal group process, set goals for Vocational and Technical Education. in Arkansas. The number one goal identified for Arkansas was: **To develop and implement responsive standardized, articulated, competency-based curricula.**

Arkansas' Student Competency Testing (SCT) Program is an integral and essential component of this goal. Student Competency Testing has direct application in two additional projects (Articulation and Course Standardization), which are being conducted as part of overall program improvement and in support of the number one goal. The following is a synopsis of the events which have occurred by the mid-point of the three year SCT pilot program:

During the fall of 1986, a management system for competency testing was planned. Computer hardware and software were researched and purchased for support of SCT. Test items were located from V-TECS. Programs to be included in the initial testing were identified and plans made for the first phase of pilot testing.

INFORMATION PHASE

The importance of including persons representing every instructional and administrative level in the planning and information phase of such a project cannot be over emphasized. The State Director for Vocational and Technical Education set the stage by speaking often and favorably in support of Student Competency Testing. He noted the priority and advantages of SCT at every opportunity when speaking to instructors, administrators and other interested parties throughout the state. The state staff was informed and included in much of the planning process.The V-TECS Technical Coordinator for Arkansas attended curriculum standardization meetings and explained the purposes and procedures for student competency testing. She also spoke at in-service meetings during the Arkansas Vocational Association Conference in August 1986. By March 1987, administrators in the nine pilot program areas of all secondary and postsecondary schools had been asked to participate in student testing. The programs participating in the pilot testing included the following:

Accounting
Computer Operator
Computer Programmer
OTL/Secretarial Occupations
Welding
Auto Mechanics
Diesel Mechanics
Electronics
Machine Tool

TASK LISTS

Because the tasks for the courses within these programs varied, V-TECS task lists were mailed to each instructor in the above programs throughout the state *(see Sample 1, page 7)*. The instructors were asked to mark those tasks which were to be included in their course(s) by April 17, 1987. The marked tasks were tallied and, based upon the common tasks, tests were generated from the V-TECS test item data bank via MODAS to match the identified tasks. It was decided that the test items in the pilot program would be C1 level (cognitive-recognition) only. The tests for the pilot program consisted of 40 to 50 multiple choice items for each course.

TEST ADMINISTRATION

The tests, along with SCAN-TRON© answer sheets and instructions for test administration, were mailed to the administrators of each participating school by April 10, 1987. Tests were to be administered and returned by April 30. Administrators were requested to either give the tests themselves or designate someone other than the course instructor to administer the tests.

TEST REPORTS

Answer sheets were read by an optical mark reader and reports generated. Individual school test results were completed and mailed to the administrators by May 20, 1987. Each school administrator received the following information:

1. An item analysis showing each item by number in the first column and the possible choices in the first row. The percent of students answering each possible choice was reflected in the table with the correct answer indicated by an asterisk. The non-distractor column indicated the answer which was not chosen by any student *(see Sample 2, page 8)*.

2. A graph depicting the frequency distribution for the class as a whole, showing the percent of correct answers of each student within a class *(see Sample 3, page 9)*.

3. A list of individual students (by number) which indicated the percent of correct answers for each student *(see Sample 4, page 10)*.

The reports indicated the mean and median score for each class, as well as the standard deviation. No student was reported as passing or failing nor were any letter grades assigned to any student on these tests. State-wide analysis was made on the results and reports were distributed to administrators and instructors to aid them in comparing their local results with those of all like students across the state. State-wide results were analyzed so that students with similar characteristics were combined. For example, there was a state-wide report for Accounting I students at the secondary level and a state-wide report for Accounting II students at the secondary level. A similar comparison was made for Computerized Accounting. (NOTE: No school was given the reports for another specific school. These reports were for the use of administrators, instructors, and program planners for the purpose of program improvement and were not to be released to the general public.) The same test was administered to all students regardless of the course level. For example, students in Auto Mechanics II received the same test as students in Auto Mechanics I. Secondary and postsecondary students received identical tests. The following is a summary of courses tested and the number of students tested in each course:

COURSES	NUMBER OF STUDENTS
Accounting I - Secondary	3164
Accounting II - Secondary	163
Accounting I - Postsecondary	221
Computerized Accounting	626
Total Accounting Students	4174
Computer Operator - Secondary	61
Computer Operator - Postsecondary	22
Total Computer Operator Students	83
Computer Programmer - Secondary	45
Computer Programmer - Postsecondary	29
Total Computer Programmer Students	74
OTL - Secondary	1571
OTL - PostSecondary	188
Total OTL Students	1759
Auto Mechanics I - Secondary	633
Auto Mechanics II - Secondary	102
Auto Mechanics - Postsecondary	130
Total Auto Mechanic Students	865
Diesel Mechanics - Postsecondary	84
Total Diesel Mechanics Students	84

Electronics I - Secondary	85
Electronics II - Secondary	22
Electronics - Postsecondary	149
Total Electronics Students	256
Machine Shop - Secondary	88
Machine Shop - Postsecondary	60
Total Machine Shop Students	148
Welding I - Secondary	112
Welding II - Secondary	19
Welding - Postsecondary	140
Total Welding Students	274
Total Students Tested	7714

PILOT PROGRAM - SECOND YEAR - 1987-88

Several concerns identified by the middle of the three year pilot program are being addressed during the second year. They include the following:

1. Quality of test items
2. Matching of test items to specific courses
3. Need for different tests for secondary/postsecondary and first/second year students
4. Standardization of test administration procedures

The following events have taken place which addressed these concerns.

1. Crosswalking Test Items to Course Content Guides

Workshops were held during the fall of 1987 and spring of 1988 in which selected instructors from each program being tested were asked to review available test items. Three objectives were met at these workshops:

a. The instructors were taught the criteria for judging a test item.
b. Test items were reviewed and some items were changed to meet required criteria .
c. Test items were assigned to specific courses by a crosswalking process , matching them to the course content guides *(see Sample 5, pp. 11-25).*

2. Test Administrators Designated at Each School

Principals or directors of each school have been asked to designate a specific person at each school to serve as SCT Test Administrator. Tests are being ordered and administered by this person at each school. All correspondence between the testing office and the schools will be through the Test Administrator *(see Sample 6, pp. 26, 27)*.

3. Multiple Tests Generated

Tests (38) are being drawn from Specific Courses at Secondary/Postsecondary levels *(see Sample 7, pp. 28, 29, order forms for specific courses)*.

FUTURE ISSUES

1. **Computer Management of Item Bank/Test Generation**
2. **Tests to be Administered Once a Year vs On Request**
3. **Use of Computer Services/Mainframe vs In-House**
4. **Continued Course /Item Crosswalking**
5. **Analysis, Interpretation, and Use of Results**
6. **Public Relations**

Sample 1

070100AV IN04 ACCOUNTING CLERK
SEE CIPS: 070705, 070102, 070104, 070401, 070204, 070708,
DOT 216.482-010 - ACCOUNTING CLERK
DOT 214.382-014 - BILLING TYPIST/CLERK
DOT 205.367-022 - CREDIT CLERK
DOT 249.367-066 - PROCUREMENT CLERK
DOT 216.132-010 - SUPERVISOR, ACCOUNTING CLERKS
O.E. CODE - 14.0303; 14.0499; 14.99

A AUDITING RECORDS
A 001 AUDIT ACCOUNTS PAYABLE/RECEIVABLE COMPUTER RECORDS
A 002 AUDIT END OF MONTH ACCOUNTS PAYABLE/RECEIVABLE TOTALS
A 003 AUDIT PAYMENT OF PURCHASES ON ACCOUNT
A 004 AUDIT STATEMENT SENT TO CHARGE CUSTOMERS
A 005 AUDIT WORK COMPLETED BY ACCOUNTS PAYABLE EMPLOYEES
A 006 AUDIT WORK COMPLETED BY ACCOUNTS RECEIVABLE EMPLOYEES
A 007 COMPARE INVOICE RECEIVED WITH ACCOUNTS PAYABLE RECORDS
A 008 COMPARE PAYMENT RECEIVED WITH RECEIPTS OR REMITTANCE STUBS

B COMMUNICATING WITH OUTSIDERS
B 001 ACCEPT PAYMENTS ON ACCOUNT MADE IN PERSON
B 002 ASSIST CUSTOMER WITH CREDIT APPLICATION
B 003 CHECK CREDIT RATING OF CREDIT APPLICANT
B 004 COMMUNICATE WITH BANK CONCERNING NSF CHECKS
B 005 COMMUNICATE WITH CHARGE CUSTOMERS CONCERNING COMPLAINTS AND REQUESTS
B 006 COMMUNICATE WITH CREDIT APPLICANTS REGARDING ACCEPTANCE OR REJECTION
B 007 COMMUNICATE WITH CREDITORS REGARDING COMPLAINTS AND REQUESTS
B 008 COMMUNICATE WITH CREDITORS REGARDING DAMAGED GOODS RECEIVED
B 009 COMMUNICATE WITH CREDITORS REGARDING LOST SHIPMENTS
B 010 COMMUNICATE WITH DELINQUENT CHARGE CUSTOMERS
B 011 INFORM NEW CUSTOMERS OF CREDIT POLICIES
B 012 OBTAIN INFORMATION FOR PURCHASE ORDER
B 013 PLACE ORDER FOR MERCHANDISE
B 014 PROVIDE REQUESTED CREDIT INFORMATION ON CHARGE CUSTOMERS
B 015 VERIFY CREDIT REFERENCES OF CREDIT APPLICANTS
B 016 VERIFY FREIGHT CHARGES
B 017 CONTACT CUSTOMER REGARDING NSF CHECK

C CORRECTING ERRORS IN RECORDS
C 001 CORRECT ACCOUNTS RECEIVABLE ERROR IN JOURNAL
C 002 CORRECT ERRORS IN JOURNALIZING ACCOUNT PAYABLE
C 003 CORRECT ERRORS IN POSTING ACCOUNTS PAYABLE
C 004 CORRECT ERRORS IN POSTING ACCOUNTS RECEIVABLE
C 005 CORRECT INACCURACIES OF PURCHASE INVOICE
C 006 CORRECT INACCURACIES OF PURCHASE RETURNS AND ALLOWANCES
C 007 CORRECT INACCURACIES OF SALES INVOICE
C 008 CORRECT INACCURACIES OF SALES RETURNS AND ALLOWANCES
C 009 RECONCILE BANK STATEMENT ON COMPANY ACCOUNT

(This is a partial listing.)

Class : ELECTRONICS
Teacher : STATEWIDE
Test name : POSTSECOND
Date : 5/27/1987
Total questions : 50
Mastery level : 25

No. of students : 149
Mean Score : 65%
Median score : 66%
Standard Deviation : 10.58

Sample 2

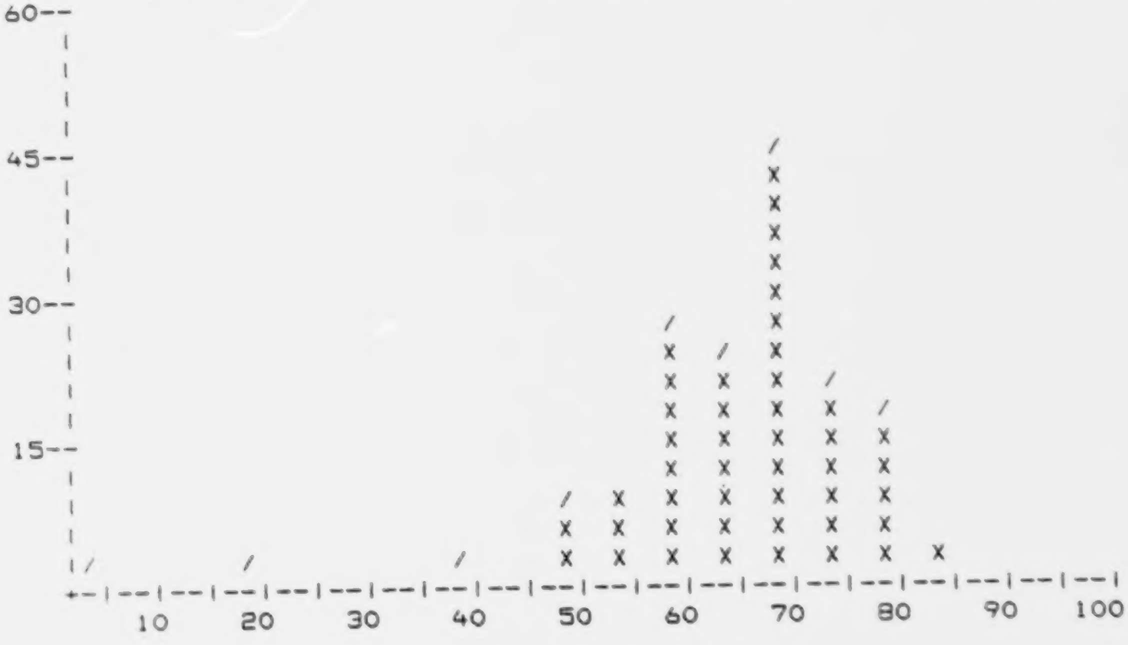
Item Analysis for POSTSECOND
Percent response

Item No.	No Answ Percent	A Percent	B Percent	C Percent	D Percent	E Percent	Mult Answ Percent	Non-Distractor
1	1	77*	6	3	13	0	0	E
2	1	40	26*	18	15	0	1	E
3	1	15	9	17	56*	0	1	E
4	1	87*	7	1	4	0	1	E
5	1	9	2	82*	5	0	1	E
6	1	89*	6	0	3	0	1	C E
7	1	1	0	0	98*	0	1	BC E
8	1	24	2	1	71*	0	1	E
9	1	65*	4	11	17	0	1	E
10	1	44*	15	24	15	0	1	E
11	1	99*	0	0	0	0	1	BCDE
12	1	98*	1	0	0	0	0	CDE
13	1	16*	49	18	15	0	0	E
14	1	68*	13	12	4	0	1	E
15	1	67	7	0	24*	0	0	C E
16	1	56*	20	11	9	0	3	E
17	1	44*	40	6	8	0	1	E
18	1	1	52	37*	7	0	3	E
19	1	95*	1	0	3	0	0	C E
20	1	97*	1	1	0	0	0	DE
21	1	94*	1	3	1	0	0	E
22	1	52*	5	18	23	0	1	E
23	1	9	72*	10	7	0	0	E
24	1	32*	3	18	46	0	0	E
25	2	23	2	60*	11	0	1	E
26	1	0	10	87*	3	0	0	A E
27	1	91*	4	4	0	0	0	DE
28	2	44*	19	24	11	0	1	E
29	2	41*	1	19	34	0	2	E
30	1	56*	2	27	14	0	0	E
31	1	15	82*	2	0	0	0	DE
32	1	2	85*	1	11	0	0	E
33	1	14	67*	3	13	0	2	E
34	1	83*	10	3	3	0	0	E
35	1	15	3	72*	8	0	1	E
36	1	18	29*	45	7	0	0	E
37	1	38	1	5	54*	0	1	E
38	1	1	95*	3	1	0	0	E
39	1	7	74*	15	2	0	1	E
40	1	0	1	99*	0	0	0	A DE
41	1	0	60*	2	38	0	0	A E
42	1	30*	28	34	5	0	1	E
43	1	16	55*	11	17	0	0	E
44	1	49	3	46*	2	0	0	E
45	3	26*	6	46	19	0	1	E
46	1	1	6	67*	25	0	0	E
47	1	86*	3	5	5	0	0	E
48	1	41	20*	7	29	0	1	E
49	1	50*	7	34	7	0	0	E
50	1	1	0	99*	0	0	0	B DE

Sample 3

```
Class :  ELECTRONICS                    No. of students :  149
Teacher :  STATEWIDE                    Mean Score :   65%
Test name :  POSTSECOND                 Median score :   66%
Date :   5/27/1987                      Standard Deviation :  10.58
Total questions :   50
Mastery level :  25
```

DISTRIBUTION OF TEST #1 - POSTSECOND



PERCENT SCORE

Sample 4

```
Class :  ACCOUNTING                              No. of students :  21
Teacher :                                        Mean Score :   64%
Test name :                                      Median score :   67%
Date :   5/11/1987                               Standard Deviation :  12.10
Total questions :   39                           Students at mastery  level:
Mastery level :  13
                          Student Grades for GRN FOREST

 Student  |Student|  %
    ID    | Grade |Score
==================================================================================
4290518026            61.5
4290554462            82.1
4290573870            61.5
4290591130            46.2
4290593163            76.9
4290597140            59.0
4300271866            69.2
4300277953            53.8
4300452643            66.7
4300592115            66.7
430[illegible]        74.4
430[illegible]        74.4
4310174171            30.8
[illegible]52681      56.4
[illegible]           66.7
[illegible]           74.[illegible]
[illegible]           66.7
[illegible]           [illegible]
[illegible]           [illegible]
[illegible]           [illegible]
[illegible]           82.1
```

BEST COPY AVAILABLE

Sample 5

STUDENT COMPETENCY TESTING TEST ITEM WORKSHOP

Presented by:
Dr. Barbara Hinton, Technical Coordinator
Student Competency Testing
University of Arkansas
GE Room 100
Fayetteville, AR 72701
Phone 575-4878

Ramada Inn
North Little Rock
January 27-29, 1988

• CONTENTS

Page

Group Divisions 1

Group Officers 2

Objectives 3

Sample Worksheets 4

Definitions 5

Test Item Guidelines

General 7

Multiple Choice 8

Matching 9

Performance 10

Sample Test Items

Performance Checklist 12

Matching Items 13

Multiple Choice Items 13

GROUP DIVISIONS: You are to divide into small groups according to your program area and level. For example, CARPENTRY should have two groups - A SECONDARY GROUP AND A POSTSECONDARY GROUP.

- **PLEASE NOTE THE FOLLOWING GROUP NAMES AND NUMBERS:**

¤ GROUP 1 - CARPENTRY SECONDARY
¤ GROUP 2 - CARPENTRY POSTSECONDARY
¤ GROUP 3 - ELECTRONICS SECONDARY
¤ GROUP 4 - ELECTRONICS POSTSECONDARY
¤ GROUP 5 - FOOD SERVICE SECONDARY
¤ GROUP 6 - FOOD SERVICE POSTSECONDARY
¤ GROUP 7 - MACHINE SHOP SECONDARY
¤ GROUP 8 - MACHINE SHOP POSTSECONDARY
¤ GROUP 9 - MASONRY SECONDARY
¤ GROUP 10 - MASONRY POSTSECONDARY
¤ GROUP 11 - DRAFTING SECONDARY
¤ GROUP 12 - DRAFTING POSTSECONDARY
¤ GROUP 13 - SMALL ENGINE SECONDARY
¤ GROUP 14 - SMALL ENGINE POSTSECONDARY
¤ GROUP 15 - WELDING SECONDARY
¤ GROUP 16 - WELDING POSTSECONDARY
¤ GROUP 17 - DIESEL POSTSECONDARY
¤ GROUP 18 - CASHIER/CHECKER POSTSECONDARY
¤ GROUP 19 - FARM BUSINESS MANAGER SECONDARY

GROUP OFFICERS:

When you meet with your group, designate one person to be the group leader and another person to be the recorder.

• RESPONSIBILITIES:

Group Leader - This person will keep the group on task and lead the discussions for both evaluating the items and assigning them to the curriculum. The leader will see that the group work is turned in at the end of the final session.

Recorder - This person will record on the TEST ITEM REVISION WORKSHEET any corrections or changes to be made in the items. The Recorder will also record the item numbers as assigned by the group to the TEST ITEM/COURSE ASSIGNMENT SHEETS.

• OBJECTIVES:

1. Evaluate test items.

A. If this is a good item, match it to appropriate task on the TEST ITEM/COURSE ASSIGNMENT SHEET.

B. If this is not a good item, correct it and record it on the TEST ITEM REVISION WORKSHEET.

2. Crosswalk the items to course content guides.

A. Determine where the item best fits in the course content guide. (It is possible that an item could fit more than one task.)

B. Record the letter code (example: A) for the test set and the item number (example: 15) beside the appropriate blank space on the TEST ITEM/COURSE ASSIGNMENT SHEET.

Example:

1.5 ____________

1.6 ____________

1.7 ____________

C. When your group has finished, turn in the following:

1. Test item set(s)
2. Test item revision worksheet(s)
3. Course content guide(s)
4. Test item/course assignment sheet(s)

-SAMPLE-

TEST ITEM REVISION WORKSHEET

REVIEWER ______________________

TEST BANK TITLE ____________ BANK #________ SCHOOL______________________

* *

LIST TEST (CHECK ONE) COMMENTS: IF A BAD QUESTION, LIST SPECIFIC REASONS.

ITEM #	GOOD	BAD	

-SAMPLE-

TEST ITEM/COURSE ASSIGNMENTS
SECONDARY

Team members:______________________________________

____

Place the number of the test item beside the task in the appropriate course column.

Carpentry - Safety	Safety Tools and Equipment
1.1 __________	1.1 __________
1.2 __________	1.2 __________
1.3 __________	1.3 __________

DEFINITION OF TERMS:

AFFECTIVE TEST ITEM. An item dealing with the measurement of attitudes or values; items that usually require an instructor to observe student behavior.

COGNITIVE. Skills which emphasize the recall of knowledge and development of intellectual abilities.

COGNITIVE TEST ITEM. An item pertaining to knowledge (as defined in Bloom's Taxonomy), which is generally measured by student performance on either written or verbal tests.

COMPETENCY. The ability (including knowledge, skills, and/or attitudes) to perform a specific task or duty successfully.

CRITERION-REFERENCED TESTS. A test designed to measure performance.

DISTRACTOR. An incorrect response to a multiple-choice or true/false test item.

DUTY. A cluster of related tasks performed by incumbent workers in an occupational domain.

NORM-REFERENCED TEST. A test on which the score of an examinee is interpreted in terms of the distribution of scores of other examinees.

PERFORMANCE OBJECTIVE. Identifies the physical attribute that a worker must possess in order to perform work in a given occupation.

PSYCHOMOTOR. Skills which emphasize manipulation of materials or tools.

PSYCHOMOTOR TEST ITEM. A test item that measures a specific performance requiring some manipulation of materials or objects or an action using neuro-muscular coordination.

STEM. That portion of a multiple-choice or true/false test item in which the statement or question is presented.

TASK. A unit of work with a definite beginning and ending which is measurable and observable. A task consists of two or more definite steps.

TASK LIST. A list of tasks performed by incumbents in a specific occupational domain.

TEST ITEM CONSTRUCTION GUIDELINES

A. GENERAL

1. Be sure each item deals with an important aspect of the content area, and not with trivia.

2. Be sure that the problem posed is clear, concise and unambiguous.

3. Be sure that each item is independent of all other items. The answer to one item should not be a condition for answering the next item, nor should a hint to one answer be unintentionally embedded in another item.

4. Avoid stereotyped phraseology.

5. Include all qualifications needed to provide a reasonable basis for response selection.

6. Be sure that the item is at the appropriate level for the competency.

7. Be sure that the item measures the intended competency.

8. Keep the reading difficulty and vocabulary level as simple as possible.

9. Avoid replication of a textbook in writing test items; don't quote directly from textual materials. Taken out of context, direct quotes from a text are often ambiguous.

10. Avoid trick or catch questions.

11. Item content should be accurate and up-to-date.

B. MULTIPLE-CHOICE ITEMS

1. The stem of the item should clearly formulate a problem. Include as much of the item as possible in the stem keeping the response options as short as possible. Include only the material needed to make the problem clear and specific. Don't add extraneous information.

2. Use negative questions or statements only if the knowledge being tested requires it. In most cases, it is more important for the examinee to know what a specific item of information is rather than what it is not.

3. If an item must be stated negatively, underline or capitalize the negative word.

4. Include four options, arranged in a logical order, if one exists (e.g., numerical, alphabetical).

5. Be sure that there is one and only one correct or clearly best answer on which experts would agree.

6. Be sure wrong answer choices (distractors) are plausible. Eliminate unintentional grammatical clues and keep the length and form of all the answer choices similar. Grammatical inconsistencies, such as "a" or "an," give clues to the correct answer.

7. Use the option "none of the above" sparingly and only when the keyed answer can be classified unequivocally as right or wrong.

8. Avoid using "all of the above." It is usually the correct answer and makes the item too easy for examinees with partial information.

9. Avoid using words such as "always," "only," and "never" that may give away a wrong answer.

10. Avoid consistent preference for any particular response position for the correct answer.

C. MATCHING ITEMS

1. Keep both the list of descriptions and the list of options fairly short and homogeneous--they should both fit on the same page. Title the lists to ensure homogeneity and arrange the descriptions and options in some logical order.

2. Make sure that all the options are plausible distractors for each description to ensure homogeneity of lists.

3. The list of descriptions should contain the long phrases or statements, while the options should consist of short phrases, words, or symbols.

4. Each description in the list should be numbered (each is an item) and the list of options should be identified by letter.

5. Include more options than descriptions. If the option list is longer than the description list, it is harder for examinees to eliminate options. If the options list is shorter, some options must be used more than once. Always include some options that do not match any of the descriptions, or some that match more than one, or both.

6. In the directions, specify the basis for matching and whether options can be used more than once.

D. PERFORMANCE ITEMS

1. Provide directions for the teacher/evaluator.
2. List the equipment needed for the performance.
3. Provide directions to the student.
4. State the task or skill to be performed.
5. State the criteria for evaluating the performance.

• Product Evaluation:

a. Include all important parts of the product.

b. Describe the parts of the product briefly and clearly.

c. Organize the parts of the checklist in a way that facilitates their assessment.

d. Make sure the rating scale is appropriate for each part of the product.

e. Base the checklist on the way the product is supposed to look, work, be repaired, etc., on the job.

f. Determine if two qualified evaluators using the checklist would score the same product in the same way or in nearly the same way.

• Process Evaluation:

a. Include all important steps of the process.

b. State the steps briefly and clearly.

c. Sequence the steps in order of performance.

d. Make sure the rating scale is appropriate for each step.

e. Make sure that all statements are observable.

f. Determine if two qualified evaluators using the checklist would score the same performance in the same way or in nearly the same way.

-SAMPLE-

PERFORMANCE CHECKLIST

TASK: Assist with unit admitting procedures.

PERFORMANCE OBJECTIVE: Given a patient to be admitted, assist with the admitting procedure. A check list will be used to rate performance. All items must receive an acceptable rating.

DIRECTIONS: Check appropriate column according to students' performance.

PERFORMANCE BEHAVIOR	YES	NO	COMMENTS
1. Prepared room for patient. 2. Introduced patient to unit. 3. Secured patient's valuables. 4. Obtained urine specimen. 5. Took patient's temperature, pulse, and blood pressure. 6. Reported unusual observations. 7. Acquainted patient with surroundings and schedule. 8. Left patient in safe and comfortable position. 9. Visited patient to aid in adjustment.			

MATCHING

DIRECTIONS: Match tool name with tool function.

Tool Name	Tool Function
1. Drill	a. Removes a small amount of material from a previously produced hole.
2. Tap	b. Produce threads in previously produced holes
3. Reamer	c. Produce a head hole flush with the material surface
4. Boring Bar	d. Remove metal from face or contouring workpiece edge
5. End Mill	e. Produce a smooth circular hole in material
	f. Produce extremely accurate finishes positioning within tenths and holding roundness within millionths

MULTIPLE CHOICE

When using CNC terminology, a "T" word usually refers to a:

a. tool function.

b. tab format.

c. track location.

d. temporary storage.

Sample 6

Vocational Technical Education
Student Competency Testing

TEST ADMINISTRATOR: ______________________________
SCHOOL: ______________________________
ADDRESS: ______________________________
PHONE: ______________________________

The Test Administrator is to fill in the attached Test Order Form. Return both this page and the Test Order Form to:

Dr. Barbara E. Hinton, Technical Coordinator
Student Competency Testing
GE Room 100
University of Arkansas 72701
Phone 575-4878

Deadline to return Order:

April 1, 1988

INSTRUCTIONS:

Column 1

- Look down the list of test names. (The code is for our purposes only.) **Determine which courses or programs are currently being offered at your school.**

Column 2

- Determine the total number of students who will be taking a particular test. (Order enough answer sheets for every student.) **Record the number of answer sheets needed** *for each test* **in Column 2.**

Column 3

- Determine the total number of students in the largest class section for each test. **Record the number of test sets needed** *for each test* **in Column 3.** (Order enough test sets to test the *largest class*. Test sets are not to be marked. The number you order should equal the largest number of students you plan to test in one setting.)

PLEASE NOTE:

Secondary Tests

In most cases, there is a separate test for 1st and 2nd year students. This is noted by the I or II following the test name. If there is only one form of the test, it is expected that 2nd year students will score higher than 1st year students.

Postsecondary Tests

Tests from the postsecondary programs will contain subtests from several courses offered under a program name. Students will be asked to take the subtests for those courses they have taken. (Example: Test 630 Carpentry will have subtests from courses such as: RCC 1105 Blueprint Reading, RCC 1210 Preconstruction, RCC1306 Floor and Wall Framing, etc.)

Vocational Technical Education
Student Competency Testing

INSTRUCTIONS TO SCHOOL DIRECTOR OR PRINCIPAL:

1. Fill in the following information:

Name of Test Administrator for your School: ________________

(This may be the counselor, an administrator, or an instructor other than one whose students are to be tested.)

Name of School: ______________________________

Address of School: ______________________________

Phone Number: ______________________________

2. Give the enclosed Test Order Packet to your Test Administrator.

Please instruct your Test Administrator to collect and return the requested information as soon as possible. Note that the deadline for Test Orders is April 1. *The actual testing should be scheduled during the first week in May.* **Specific test instructions along with test sets and answer forms will be mailed to your Test Administrator by April 20.**

3. Return this infomation sheet to:

Dr. Barbara Hinton, Technical Coordinator
Student Competency Testing
GE Room 100
University of Arkansas
Fayetteville, AR 72701
Phone 575-4878

Sample 7

VOCATIONAL TECHNICAL EDUCATION
STUDENT COMPETENCY TESTING
SECONDARY TEST ORDER FORM

Code and Name of Tests:		Number of Answer Sheets Needed:	Number of Test Sets Needed:
Agriculture Education			
025	Farm Business Manager		
Business Education			
105	Accounting I		
110	Accounting II		
115	Computerized Accounting I		
120	Computerized Accounting II		
125	Computer Technology Intro.		
130	Computer Programming Advanced Basic		
135	Office Technology Laboratory/ Office Procedures		
140	Typewriting I		
145	Typewriting II		
150	Word Processing I		
155	Word Processing II		
Trade and Industrial Education			
210	Carpentry I		
211	Carpentry II		
230	Drafting I		
231	Drafting II		
250	Electronics		
270	Food Service(Culinary Arts)		
280	Machine Shop		
290	Masonry I		
291	Masonry II		
350	Welding I		
351	Welding II		

VOCATIONAL TECHNICAL EDUCATION STUDENT COMPETENCY TESTING POSTSECONDARY TEST ORDER FORM

Code and Name of Tests:	Number of Answer Sheets Needed:	Number of Test Sets Needed:
Adult Training & Retraining		
500 Cashier/Checker		
Business Education		
520 Business Data Processing Option		
540 Computerized Accounting Option		
560 Secretarial/Word Processing/ Administrative Support Option		
580 General Office Option		
Trade and Industrial Education		
630 Carpentry		
650 Diesel Mechanics		
670 Drafting		
690 Electronics		
710 Food Services		
730 Machine Shop		
750 Masonry I		
751 Masonry II		
770 Small Engines		
790 Welding		

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Managing Test Results: Scoring, Reporting Results, and Interpreting Data

Presented
by

Chris Olson
Michigan

Tuesday, April 12
10:00 am - 11:00 am
2:00 pm - 3:00 pm
3:30 pm - 4:30 pm

Managing Test Results

Scoring, Reporting Results, and Interpreting Data

a paper presented by

Chris M. Olson, Ph.D.
Associate Professor and Director
Michigan Occupational Student Assessment Center
Department of Agricultural and Extension Education
Michigan State University
East Lansing, MI 48824

517-353-0661

National Conference on Critical Issues
in Competency Based Testing
for Vocational-Technical Education

Nashville, Tennessee

April 11 - 13, 1988

Table of Contents

1 Introduction 1
2 Scoring 3
3 Reporting Results 4

- 3.1 Raw Score Distribution 4
- 3.2 Alphabetic Student Listing 4
- 3.3 Evaluation Services Scoring Feedback Report 4
- 3.4 Item Analysis 5

4 Interpreting Data 5

- 4.1 Summative Data 5
    - 4.1.1 Raw Score 5
    - 4.1.2 Percentile Rank 6
    - 4.1.3 Standard Score 6
    - 4.1.4 Grading 7
- 4.2 Formative Data 9
    - 4.2.1 Index of Difficulty 9
    - 4.2.2 Index of Discrimination 10
    - 4.2.3 Measurement of Change or Gain 11

5 Conclusion 18
6 Reference List 19
7 Appendix A 20
8 Appendix B 21
9 Appendix C 22
10 Appendix D 23
11 Appendix E 24
12 Appendix F 25
13 Appendix G 26
14 Appendix H 27
15 Appendix I 28

1 Introduction

In 1985, the Michigan Occupational Student Assessment Center was established at Michigan State University to assist Michigan's 53 Career Education Planning Districts (CEPD's) comply with the Carl D. Perkins' Vocational Education Act of 1984 requirement that at least 20 percent of vocational education fiscal agencies annually participate in evaluation. The Model, as approved by the Michigan Department of Education on March 5, 1986, considers four aspects of vocational education:

1. The percentage of 11th and 12th graders of the total 11th and 12th grade population in each CEPD enrolled in vocational education.

2. The percentage of vocational graduates placed in related employment or who continue their education.

3. The percentage of vocational enrollees who participate in the student assessment process.

4. The size of the CEPD according to student population.

In the first year, 1985, the Michigan Occupational Student Assessment Center was established and work began to develop computer programs and gather test items to help the CEPD's comply with the student assessment provision of the model. Beginning in 1986 and for the next four years for the model to be in effect, certain CEPD's were designated as participants. At the end of each year, the CEPD's participating that year are ranked according to their performance in the four components of the model and incentive funds are divided among them. The only requirement on these incentive funds is that at least half the money going to a CEPD be spent to strengthen the area where they performed least favorably. For example, if a CEPD is low in enrollment and higher in both the percentage of graduates placed and the percentage of students assessed, at least half the incentive funds going to that CEPD must be spent on activities to recruit students.

The process begins with teachers who, working with their advisory committee, identify the tasks taught in their program and for which they would like to test. These specifications are then sent to the Student Assessment Center and tests are developed around those tasks. The test developer enters the mainframe on campus using a microcomputer and modem and selects the test items. The resulting 'Form A' of the test will contain more items than requested by the teacher. The teacher is asked to review each item and reject items which they feel don't reflect the content of their program. This information is then sent back to the test developer at Michigan State University and the Form A test is modified into a 'Form B' which should contain only items the teacher wants. The validity of Form B is based on the content of the program as determined by the teacher's selection of test items. If upon review of Form B, a teacher decides against certain items, the answer is left blank on the **Item Analysis Header/Key Sheet** they complete to use the scoring service provided by the Center and the question will not be scored. Teachers have total control over the items they select from the item bank that are on their test and may even add their own questions to a test to supplement those provided by the Center if they choose.

Applications Programming at the Michigan State University Computer Center was responsible for developing the computer software required to develop the tests. They utilized certain features of an existing test item management program developed for campus use called SOCRATES and wrote the additional programs required to meets the specifications of the test item bank as outlined by Center staff and the project monitor from the Vocational-Technical Education Services (V-TES) of the Michigan Department of Education.

Center staff were responsible for gathering test items from member states in the Vocational Technical Consortium of States (V-TECS), coding these items to V-TECS' tasklists, and entering them in the mainframe. All written items are four choice multiple choice. Software maintenance is done by the Computer Center and test item maintenance is done by Center staff.

A pilot of the program utilizing test items coded and entered by Center staff was completed in the spring of 1986. The Student Occupational Assessment service was provided to CEPD's in the first year of the model beginning July, 1986. During the first year, approximately 25,000 students were assessed in a total of 27 CEPD's, 16 of the 27 were in the model the first year and the additional 11 CEPD's were voluntary. In some cases, the additional 11 were in the second year of the model and wanted to begin early to do pretesting in the fall, 1987.

The codification of items can be justified at three levels:

1. At the most general level, the tasklist level, it is appropriate to code items that are related to all tasks within a tasklist. A good example of this might be safety items, employability skills items, or items of a general nature prerequisite to the performance of any task in the list. There are items in the bank at this level.

2. At the next level of specificity, the duty level, it is appropriate to code items that are related to all tasks within a certain duty. These items could include safety items related to a specific tool used for tasks only within that duty or general items related to all tasks within a specific duty.

3. At the most specific level, the task level, items are coded that are specific to a given task. At the present time, about half of the written items in the item bank are coded to specific tasks. By summer, 1988, this should increase to about 75%. As of March 14, 1988, the inventory of test items includes:

- Approximately 21,000 items coded to tasks in 86 tasklists
- 7400 items coded generically at the tasklist level
- 3000 items coded at the duty level
- 7300 items coded to individual tasks

An example of a page from a written test is included in Appendix A.

It should be pointed out that 'filling' the item bank takes time and, initially, test items were not coded to tasks for all task lists. It was important for first year participants to have access to items for as many programs as possible. However, Center staff are continually working at putting more and more items into the bank at the task level.

Performance tests are also available from the test item bank. The performance tests include the information printed in the V-TECS catalog for each task as developed by incumbent workers following the V-TECS catalog development process. The logic behind the performance tests is that the task analysis performed by the incumbent workers provides the most valid information available for the performance of each task. The performance tests come in two sections:

- Directions to the Student
- Evaluator's Response

A checklist is provided for the evaluator to indicate that the student performed each step of the procedure for performing the task as reported by the incumbent worker. Performance of this procedure represents what is called **Process** evaluation. The student is evaluated according to the process for performing the task. **Product** evaluation is also provided as a 'standard' of acceptable performance as reported by the incumbent workers in the task analysis procedure is provided on the performance test.

An example of a performance test is contained in Appendix B.

In Michigan, both written and performance testing are recommended. Experience to this date indicates that many CEPD's will do written testing the first year and written and performance testing in the second year.

2 Scoring

The Michigan Occupational Student Assessment Center provides a scoring service. When Form B tests are sent to the teacher, a supply of student answer sheets is also sent along with an **MSU Scoring Office-Job Header Sheet** which identifies the teacher and location and an **Item Analysis Header/Key Sheet** which is the answer key which will program the scanner. After the teacher administers the test, the Job Header Sheet, Key Sheet, and student answer sheets (examples are contained in Appendix C) are packaged together and returned to the Center. Center staff deliver these packages to the Scoring Office. Scoring is usually an overnight process and the results are sent back to the teacher within three working days from when the Center received the package from the teacher. If scoring is to be done at the end of one of MSU's terms, scoring takes longer. The scoring service is the same one offered to University Faculty and the University work takes precedent. In this event, the results are usually sent back in a week.

3 Reporting Results

The results package sent back to the teacher contains four parts:

- o Raw Score Distribution
- o Alphabetic Student Listing
- o Evaluation Services Scoring Feedback Report
- o Item Analysis

A 'Cover Sheet' called **Header Analysis** will provide the name of the instructor, the program area, the current date, the number of items on the test, and the number of student scores. Other information will include statistical and output options that Center staff have selected. The statistical and output options are the same for each test scored using the scoring service. (see Appendix D)

3.1 Raw Score Distribution

The **Raw Score Distribution** report lists the raw scores for the test from high to low, the frequency that each score was obtained, the accumulated frequencies which will equal the total number of students taking the test, a percentile rank for the scores on this test, and a standard score with a mean of 50 and a standard deviation of 10. The Raw Score Distribution report is useful when informing students how they did in comparison to the rest of those taking the test. (See Appendix E)

3.2 Alphabetic Student Listing

The **Alphabetic Student Listing** contains the information on the Raw Score Distribution report with two additions:

- o The student names are listed alphabetically.
- o Questions unanswered by a student are identified.

The Alphabetic Student Listing organizes the Raw Score Distribution information alphabetically by all the students who took the test. This is useful when recording information for grading or other purposes. In addition, questions not answered by each student are identified by number. This is helpful when reviewing the test with each student. (See Appendix F)

3.3 Evaluation Services Scoring Feedback Report

The **Evaluation Services Scoring Feedback Report** is prepared for each student taking the test whose answers were scored. For each question, it lists the student's response followed by the correct response. If a student failed to answer a question, the place for the student response is left blank.

This report also provides information for the student on their raw score, percentile rank, and standard score. It is a convenient method to report student performance to the student and provide an opportunity for the student to review the test questions and compare their response to the correct response. (See Appendix G)

3.4 Item Analysis

An **Item Analysis** report is prepared for each test item on the test. The Item Analysis is actually two reports:

- A summary report allowing a review at a quick glance (See Appendix H)
- A more detailed report with raw scores and percentages (See Appendix I)

Key to the item analysis are the Difficulty and Discrimination Indices prepared for each item. The **Index of Difficulty** is the percentage of the total group marking a wrong answer or omitting the answer for the item. The **Index of Discrimination** is computed by comparing the responses to each question of the groups scoring in the upper and lower 27% on the test. The difference between the percentage of the upper group marking the correct answer and the percentage of the lower group marking the correct answer is the index of discrimination.

4 Interpreting Data

While the Michigan Model provides incentive funds each year for CEPD's in the model for the improvement of enrollment, placement, and student assessment, a primary (and perhaps more important) benefit from participating in the student assessment process provided by the Center at Michigan State University is for the **improvement of instruction.** Data for both summative and formative purposes are provided to the instructor. The summative data is a convenience to be used in traditional scoring and grading procedures and includes the raw score, percentile rank, and standard score. The formative data allows the instructor to consider student performance on the tasks in the instructional program and make decisions on the effectiveness of instruction for those tasks. Formative data includes the item analysis, difficulty, and discrimination indices.

4.1 Summative Data

Data used for summative purposes such as grading allows students to be compared to each other. This summative data provided the teacher includes the raw score, percentile rank, and standard score for each student.

4.1.1 Raw Score

The raw score is the actual score obtained by each student taking the test. The raw score is provided on three reports:

1. Raw Score Distribution: The raw score is listed from high to low with both the frequency each score was obtained and the accumulated frequencies. The number of items on the test, the mean score, standard deviation, and variance are also reported. (See Appendix E)

2. Alphabetic Student Listing: The raw score is reported for each student in an alphabetical listing. (See Appendix F)

3. Evaluation Services Scoring Feedback Report: This report is intended to be given to the student and has that student's raw score. (See Appendix G)

4.1.2 Percentile Rank

If a teacher wishes to interpret test scores by a student's standing in a class, the Percentile Rank can be used. The Percentile Rank corresponding to a specific raw score provided through the scoring service is the percentage of students receiving lower scores plus half the students receiving that particular score.

Sometimes Percentile Ranks are confused with test scores expressed as percentages. They are quite different. Test scores expressed as percentages indicate the percentage of questions the student answered correctly or the performance of the student on the test. Percentile Ranks compare each student's score with other scores on the test and range from near 0 to near 100.

Sometimes student performance is affected by the difficulty of the test. Since test difficulty should affect all students equally, a percentile can provide an important indicator of a student's performance with respect to other students taking the same test. The Percentile Rank reported to the teacher considers only the group of students for whom the scores are reported in that report and should not be used to compare students whose tests were scored separately.

The Percentile Rank is reported on the Raw Score Distribution report, the Alphabetic Student Listing report, and the Evaluation Services Scoring Feedback report.

4.1.3 Standard Score

Standard scores have perhaps little value for our purposes. The use of standard scores allows a comparison of a group of students taking two different tests such as a mathematics test and an English test. Because the mean and standard deviation of both tests would most likely be different, comparing performance on both tests would be meaningless. When computing standard scores, the standard deviation is used as the unit of measurement allowing the comparison of student performance on both tests.

The standard scores computed and reported by the scoring service have a mean of 50 and a standard deviation of 10. The standard score is computed by subtracting the mean from the student's raw score and dividing the result by the standard deviation. The standard scores reported by MSU's scoring service take the result, multiply it by a standard deviation of 10, and add it to a mean of 50.

For example, if a student has a raw score or 43 on a test where the mean is 34.69 and a standard deviation of 7.1, the standard score is computed: $43 - 34.69/7.1 = 1.17$. 1.17 multiplied by our standard score standard deviation of 10 and added to the standard score mean of 50 provide a standard score of 61.7.

4.1.4 Grading

Grading can be a controversial subject. There are those that believe it is essential that students be compared to each other's performance on achievement tests. This usually results in some form of 'curve' or other method to rank that performance to assign grades. These tests are sometimes referred to as 'norm-referenced'' or 'teacher-made'.

There are others that believe that students should be 'graded' with respect to their 'mastery' of the subject matter. Tests of this type are usually called 'criterion-referenced'. Theoretically, if all students mastered the subject matter, each would receive the top grade, perhaps an 'A' or 'Pass'.

There are many alternative procedures, some scientific and some informal, if a teacher chooses to grade students by comparing their performance to each other. Most teachers have a 'favorite' or perhaps the procedure is prescribed by the school.

The following procedure is offered because it is scientific, provides for uniformity among different teachers, and accounts for both the standard deviation of a test and the ability level of the students being graded. It is a procedure offered by Robert L. Ebel in 1979 in the 3rd Edition of **Essentials of Educational Measurement**. The following discussion has been adopted and paraphrased from his work.

There are four steps involved in this process of assigning marks:

1. Select from the following table a distribution of marks appropriate to the level of ability of the class being graded.

Ability Level	Lower Limit of A's	Percent of Marks					Ability Measures	
		A	B	C	D	E	GPA	Percentile
Exception	0.7	24	38	29	8	1	2.80	79
Superior	0.9	18	36	32	12	2	2.60	73
Good	1.1	14	32	36	15	3	2.40	66
Fair	1.3	10	29	37	20	4	2.20	58
Average	1.5	7	24	38	24	7	2.00	50
Weak	1.7	4	20	37	29	10	1.80	42
Poor	1.9	3	15	36	32	14	1.60	34

The left column in the table lists the ability levels. The appropriate level for a given class can be determined one of two ways: using the average Grade Point Average (GPA) of all class members from previous course work or, if the GPA is not available, the average aptitude scores can be used. Select the appropriate level from one of the two columns to the right, either GPA or the average Percentiles from aptitude scores.

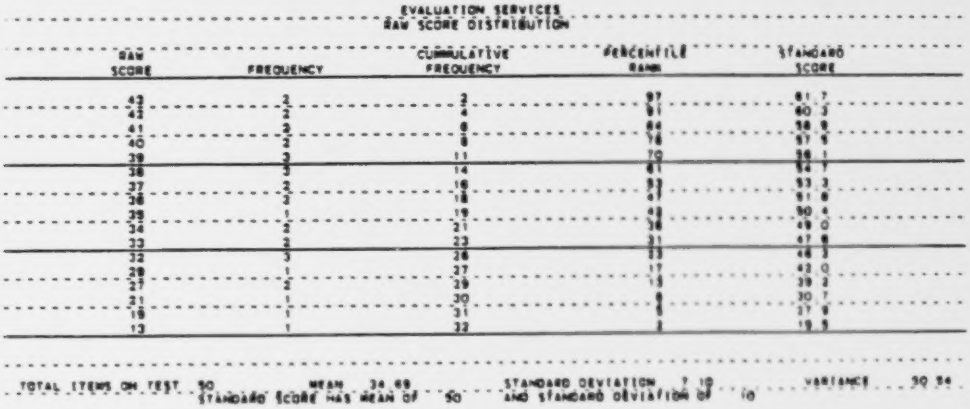
2. Calculate the median and the standard deviation for the test. The median is simply the middle score. If, for example, there are 25 scores, the median would be the 13th score. If there are 26 scores, the median would be the average of the 13th and 14th scores. Use the Raw Score Distribution report for a list of scores from high to low and determine the median.

The standard deviation can be calculated or taken from the Raw Score Distribution report.

3. Determine the lower score limits of the A, B, C, and D mark intervals using the median, the standard deviation, and the appropriate lower limit factor from the table.

The values in column labeled 'Lower Limit of A's' represent how far the lower limit of the A scores lie above the median. For example, in the 'Exceptionable' Ability Level, the lower limit of the A scores lies 0.7 standard deviations above the median score of the distribution.

Use the following as an example (from Appendix E):



EVALUATION SERVICES
RAW SCORE DISTRIBUTION

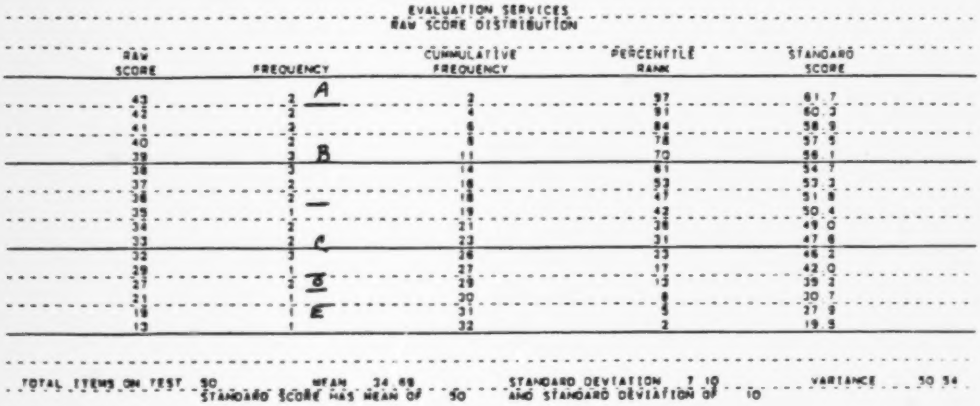
RAW SCORE	FREQUENCY	CUMULATIVE FREQUENCY	PERCENTILE RANK	STANDARD SCORE
43	2	2	97	61.7
42	2	4	91	60.3
41	2	6	84	58.9
40	2	8	78	57.5
39	3	11	70	56.1
38	3	14	61	54.7
37	2	16	53	53.3
36	2	18	47	51.8
35	1	19	42	50.4
34	2	21	38	49.0
33	2	23	31	47.6
32	3	26	23	46.2
29	1	27	17	42.0
27	2	29	13	39.2
21	1	30	8	30.7
19	1	31	5	27.9
13	1	32	2	19.5

TOTAL ITEMS ON TEST 50   MEAN 34.69   STANDARD DEVIATION 7.10   VARIANCE 50.34
STANDARD SCORE HAS MEAN OF 50 AND STANDARD DEVIATION OF 10

This distribution represents a group of students whose ability level is rated as 'Superior.' The median score is 36 and the Standard Deviation is 7.10. The lower limit of the A scores is thus 0.9 (from the chart) Standard Deviations above the median score of 36 or 42.39. The lower limit of the B score is one standard deviation less or 35.29. The lower limit of the C score is 28.19 and the D score 21.09.

Grade	Lower Limits	Intervals	Number	Percent
A	36 + (0.9 x 7.1) = 42.39	43	2	6
B	42.39 - 7.1 = 35.29	36 - 42	16	50
C	35.29 - 7.1 = 28.19	29 - 35	9	28
D	28.19 - 7.1 = 21.09	22 - 28	2	6
E		0 - 21	3	10

4. Assign the designated marks to the students whose scores fall in intervals determined for each mark.



EVALUATION SERVICES
RAW SCORE DISTRIBUTION

RAW SCORE	FREQUENCY		CUMMULATIVE FREQUENCY	PERCENTILE RANK	STANDARD SCORE
43	2	A	2	97	61.7
42	2		4	91	60.3
41	2		6	84	58.9
40	2		8	78	57.5
39	3	B	11	70	56.1
38	3		14	61	54.7
37	2		16	53	53.3
36	2	—	18	47	51.9
35	1		19	42	50.4
34	2		21	36	49.0
33	2	C	23	31	47.6
32	3		26	23	46.2
29	1		27	17	42.0
27	2	D	29	13	39.2
21	1		30	8	30.7
19	1	E	31	5	27.9
13	1		32	2	19.5

TOTAL ITEMS ON TEST 50 MEAN 34.69 STANDARD DEVIATION 7.10 VARIANCE 50.34
STANDARD SCORE HAS MEAN OF 50 AND STANDARD DEVIATION OF 10

4.2 Formative Data

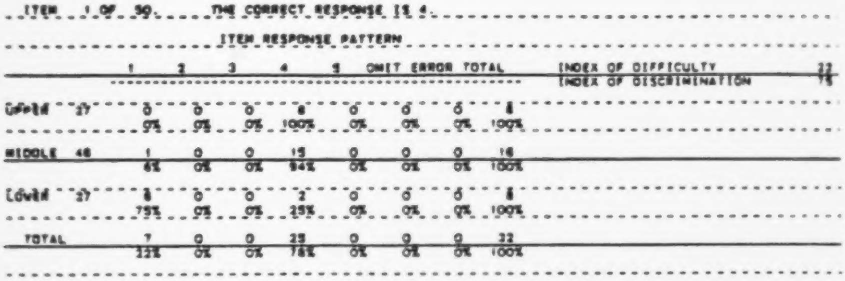
As was mentioned previously, perhaps the most important aspect of the Scoring Service is the opportunity it provides through item analysis for the improvement of instruction by the measurement of change or gain in the student's performance. The Item Analysis Report comes in two sections. The first is a one line per test items report (Appendix H) and the other a matrix showing both the percentage of scores in each group and for each distractor as well as the raw number (Appendix I).

A number of statistics are reported with the item analysis which can be used to evaluate the effectiveness of an item. The interpretation of each statistic will be discussed as it relates to both normative and criterion referenced testing.

4.2.1 Index of Difficulty

The Index of Difficulty is the proportion of the total group who took the test who got a particular item wrong. A high Index of Difficulty indicates a difficult item and a low Index a relatively easy item.

In the following example, 78% of the students got the question correct. The Index of Difficulty is 22 (100% - 78% = 22).



ITEM 1 OF 50 THE CORRECT RESPONSE IS 4.

ITEM RESPONSE PATTERN

		1	2	3	4	5	OMIT	ERROR	TOTAL
UPPER	27	0 0%	0 0%	0 0%	8 100%	0 0%	0 0%	0 0%	8 100%
MIDDLE	46	1 6%	0 0%	0 0%	15 94%	0 0%	0 0%	0 0%	16 100%
LOWER	27	6 75%	0 0%	0 0%	2 25%	0 0%	0 0%	0 0%	8 100%
TOTAL		7 22%	0 0%	0 0%	25 78%	0 0%	0 0%	0 0%	32 100%

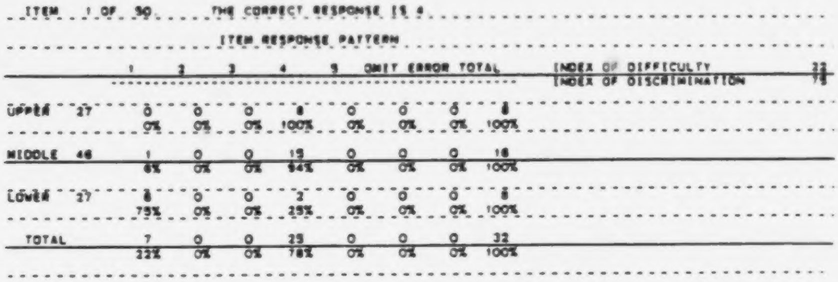
INDEX OF DIFFICULTY 22
INDEX OF DISCRIMINATION 75

For classroom achievement tests, the Index of Difficulty should range no lower than 20 nor higher than 80 with a more desirable range between 30 or 40 and 60. However, in criterion-referenced instruction when mastery of the objective or task is desirable, it is hoped that all students who respond to an item for a given test will get it correct. Thus, the ideal Index of Difficulty will be 0. In this situation, lower numbers will be more desirable. If an item proves to be difficult or large numbers of students respond with an incorrect answer, it could signal that the content of the task as represented by the test question was not mastered.

4.2.2 Index of Discrimination

The Index of Discrimination is the difference between the proportion of a group of students who did better on the test who got the item correct and a group of students who did poorer on the test and got the item correct. The Item Analysis provided to Michigan teachers considers the better group as the top 27% of the total group who took the test and the poorer group as the bottom 27%.

In the previous example, 100% of the upper group got the question correct and 25% of the lower group responded correctly. The Index of Discrimination is 25 (100% - 25% = 75).



```
ITEM   1 OF  30        THE CORRECT RESPONSE IS 4

                       ITEM RESPONSE PATTERN

                  1     2     3     4     5   OMIT ERROR TOTAL     INDEX OF DIFFICULTY        22
                                                                   INDEX OF DISCRIMINATION    75

UPPER   27        0     0     0     8     0     0     0     8
                 0%    0%    0%  100%    0%    0%    0%  100%

MIDDLE  46        1     0     0    15     0     0     0    16
                 6%    0%    0%   94%    0%    0%    0%  100%

LOWER   27        6     0     0     2     0     0     0     8
                75%    0%    0%   25%    0%    0%    0%  100%

  TOTAL           7     0     0    25     0     0     0    32
                22%    0%    0%   78%    0%    0%    0%  100%
```

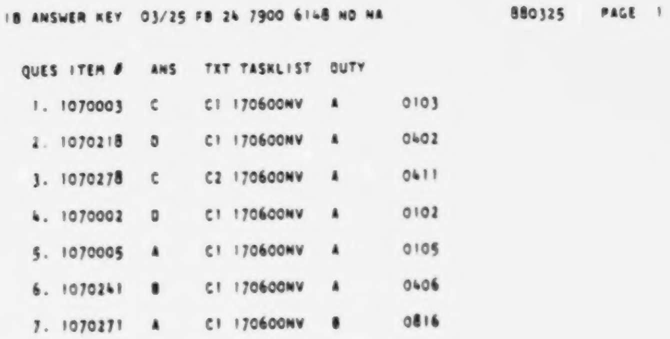
Again it must be remembered that in criterion-referenced instruction, when mastery of the content by all students is deemed desirable, a low Index of Discrimination would be desirable. In other words, if 100% of the students in the better group mastered the content and got the item correct and 100% of the students in the poorer group mastered the content and got the item correct, the Index of Discrimination would be 0.

Sometimes a test item will discriminate negatively. In other words, a greater proportion of the students in the poorer group have answered the item correctly than students in the better group. This often means there is a problem with the question and the question should be revised or discarded.

4.2.3 Measurement of Change or Gain

The Index of Difficulty and the Index of Discrimination provide insight into the degree of mastery of the content related to specific tasks as indicated by low numbers. However, there is an additional procedure, simple to use, which can be a powerful tool when determining if instruction should be revised. This procedure, originally designed to evaluate the effectiveness of programmed instruction, has been refined by Brennan (1975) for use with objective or criterion referenced instruction.

This procedure uses both baseline and observed student performance data on **tests whose items are related to the objective (or task).** The following is a sample from the answer sheet provided with both the Form A and Form B tests in Michigan.



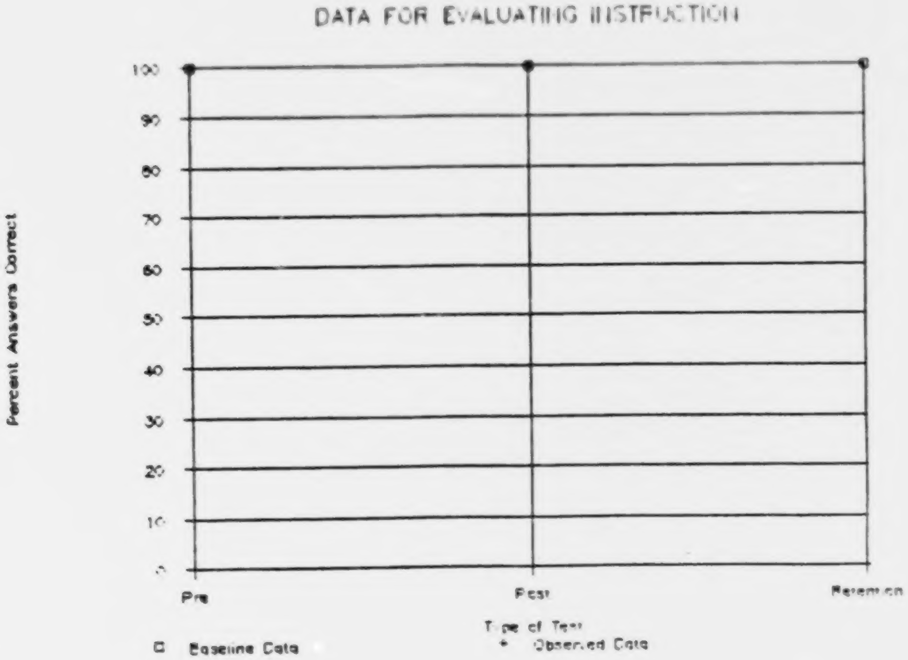
```
1B ANSWER KEY  03/25 FB 24 7900 6148 NO NA              880325    PAGE  1

 QUES ITEM #   ANS   TXT TASKLIST  DUTY

  1. 1070003   C     C1 170600NV   A        0103

  2. 1070218   D     C1 170600NV   A        0402

  3. 1070278   C     C2 170600NV   A        0411

  4. 1070002   D     C1 170600NV   A        0102

  5. 1070005   A     C1 170600NV   A        0105

  6. 1070241   B     C1 170600NV   A        0406

  7. 1070271   A     C1 170600NV   B        0816
```

At the end of the line for question 1, is 'A 0103.' Question 1 is coded to Duty A, question 1, and is the third item coded to that task. Tests in Michigan (where the items are coded at the task level) provide a direct link back to program content at the task level.

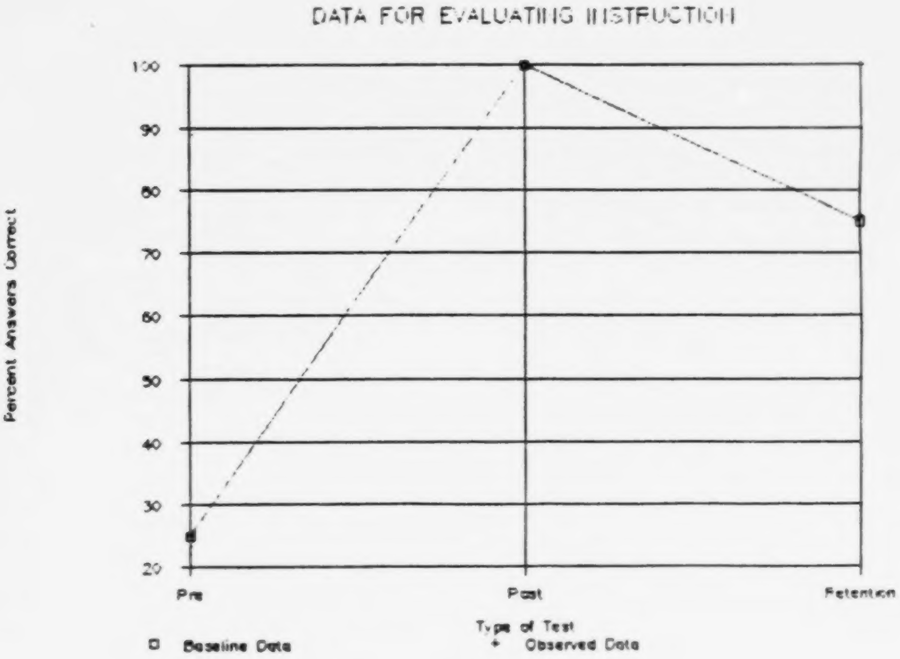
If test items are not coded to the task level, the teacher can review the item and determine which task the item is measuring. This alternative may be desirable when used in combination with the direct link as the teacher will determine if the coding is appropriate.

The measurement of change or gain through instruction ideally uses three tests: a pre test, a post test, and a retention test. Retention tests can be pre tests given after a time interval and prior to advanced or continued instruction.

The procedure works as follows. A graph is designed with a vertical axis that represents the percent of correct responses to the question and a horizontal axis that represents the testing procedures: pre test, post test, retention test.



First, baseline data or the scores (sometimes called 'cut off') that the evaluator and subject matter specialist deem reasonable are entered. If the test item has four distractors, it is reasonable that without instruction, 25% of the students could answer the question correctly by guessing. A dot is placed on the vertical axis over Pre Test at 25%. If the instruction is truly criterion referenced, it is logical to expect that after instruction and on the post test, 100% of the students will respond correctly. The retention test baseline data represents the percentage of students who, after a given period of time (perhaps the 3 months during the summer) will be able to respond correctly to the question. For the sake of our example, let's say we will accept 75% on the retention test. The three dots can now be connected with lines. This represents what we consider acceptable as baseline data.



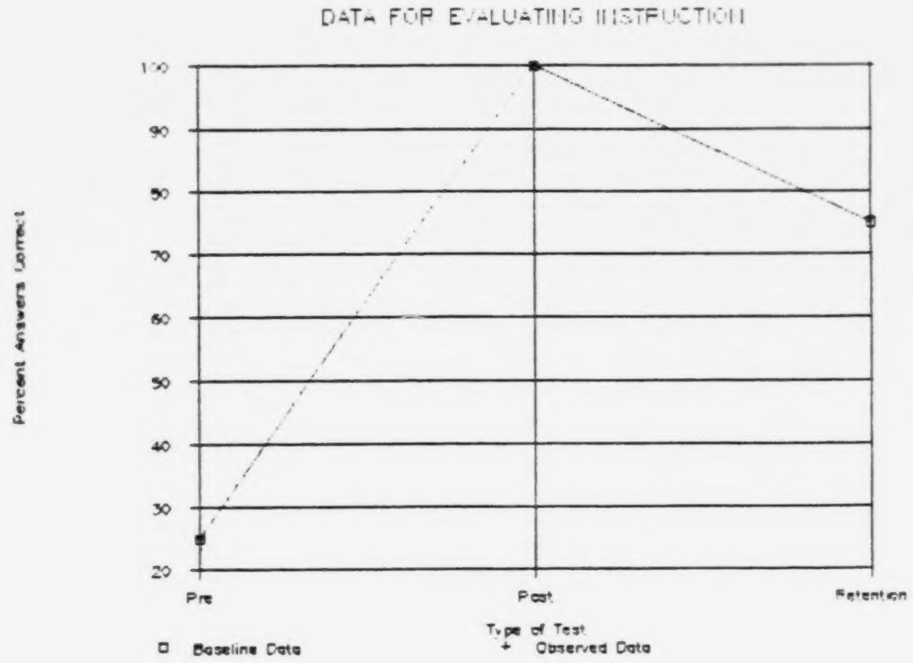
Next, observed data needs to be entered. This can be entered at any time during the process.

If a pre test is not used, a dot can be placed on the vertical axis at the 25% level, the same as the baseline data. After the post test, the percentage of students who answer the question correctly can be entered at the intersection of that data and the post test column. This provides the first clue to the effectiveness of instruction. If 100% is desirable and the post test data is considerably below 100%, something is wrong.

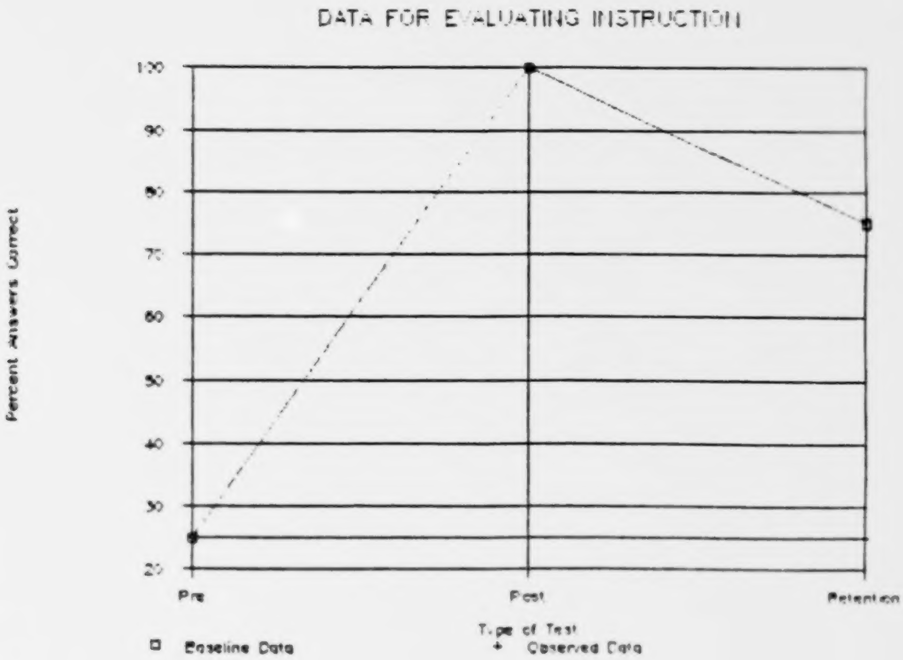
Finally, when the retention test is given, that data can be entered and the dots again connected by a line. The graph now pictures what was acceptable as baseline and what the actual (or observed) data was. Decisions can now be made about the effectiveness of instruction.

The following four examples represent four rules for interpreting the graph.

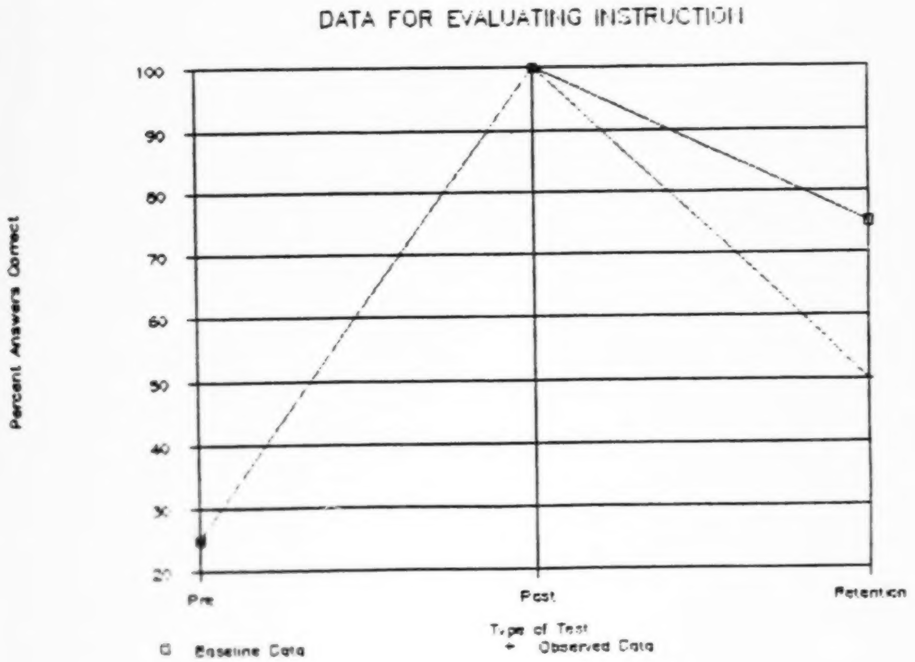
In **Rule 1**, both the post test and the retention data indicate the ideal situation. Observed scores fall at or above the base data line.



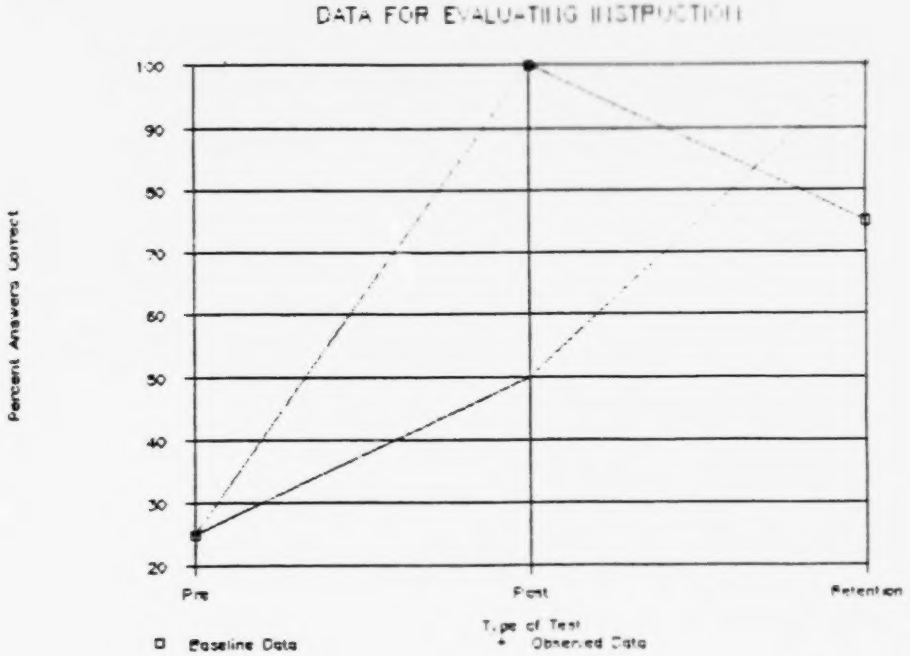
Rule 2 shows that instruction has not had any effect. The pre, post, and retention test data reveal no change or gain. There has been no observable cognitive effect from instruction.



Rule 3 shows that instruction has had the desired effect based on post test data but that the students have not retained the learning. The teacher can now make a decision. Either the retention base line can be revised or instruction examined and revised to promote longer retention.



Rule 4 shows that instruction has not had the desired effect as determined by post test data. However, the retention test data has indicated that the learning has taken place at some time. Again, this provides a clue for the evaluator and teacher and has implications for the revision of instruction.



It is also possible and reasonable that one can evaluate any of the three groups, Upper, Middle, Lower. For example, if it can be assumed that 'special needs' students would fall into the lower group, the observed data could be charted separately. Instead of charting the 'Total', simply chart the percentage of the 'Lower' group that responded correctly. This would provide a picture of how they (or any of the groups) had performed.

Brennan is careful to point out the subjective nature of this process. The specification of cut off scores can only be made on the basis of judgment on the part of the evaluator and the subject matter specialist. Decisions concerning revision of instruction can only be made by the subject matter specialist.

5 Conclusion

Testing in can be a useful opportunity for not only complying with the requirements of a school for grading but also to evaluate instruction. This paper has attempted to:

1. Familiarize the reader with student assessment in Michigan as it relates to Michigan's compliance with the Carl D. Perkins' Vocational Education Act of 1984 requirements.

2. To provide an alternative for using scoring results to convert student performance into letter grades.

3. To present a model for evaluating instruction using item analysis data to determine change or gain as a result of instruction.

6 Reference List

Brennan, Robert L. A Model for the Use of Achievement Data and Time Data in an Instructional System. Instructional Science 3, 1975, 113-136.

Ebel, Robert L. Essentials of Educational Measurement. Englewood Cliffs, New Jersey: Prentice-Hall, 1979, 248-252.

Olson, LeRoy A. Item Analysis. An unpublished paper available from the Michigan State University Scoring Office.

Olson, LeRoy A. Interpretation of the Index of Discrimination. An unpublished paper available from the Michigan State University Scoring Office.

Olson, LeRoy A. Test Score Distributions. An unpublished paper available from the Michigan State University Scoring Office.

7 Appendix A

03/25 FB 24 7900 6148 ND NA

1. When arranging patients' rooms, aides must do all of the following EXCEPT:

    A. check signal cords.
    B. fix the back and knee rests as directed.
    C. give patients their medications.
    D. check lighting.

2. If a patient calls on the intercom while you are at the nursing station:

    a. go to the patient's room and ask what is needed.
    b. check to see if that patient is assigned to you.
    c. call the charge nurse to answer the intercom.
    d. ask the patient what is needed using the intercom.

3. When a patient says, "I'm too tired to have this done right now," you should:

    a. report to the team leader that the patient hates the procedure.
    b. insist that it will make her/him feel better and proceed.
    c. see to any immediate needs, allow her/him to rest, and return later.
    d. report on the chart that the procedure was refused.

4. Which of the following questions should you ask the patient (or a visitor if the patient is unable to answer) when filling out the admission checklist?

    A. Are you allergic to any foods or drugs?
    B. Do you wear dentures?
    C. Do you have any valuables with you?
    D. All of the above.

5. Which of the following things should you do to familiarize the patient with his/her surroundings?

    A. Show him/her where the signal cord is and how to work it.
    B. Tell him/her not to operate the TV.
    C. Ask visitors to leave the room while you finish admitting the patient.
    D. Raise the siderails of the bed and raise bed to high position.

DIRECTIONS TO THE STUDENT:

Your DUTY is: PERFORMING ELECTRICAL DUTIES.

TASK: You will: Adjust tension on a v-belt drive.

CONDITIONS: You will be provided: a pry bar, socket set, 6" crescent, and open end wrenches.

DIRECTIONS TO THE EVALUATOR: Observe the student performing the TASK. Use the checklist to indicate, in your professional judgment, student performance at a level that will enable the student to be employable. PRODUCT EVALUATION may appear in the EVALUATOR'S RESPONSE.

Checklist:	Yes	No
The student:		
1. Inspected belts.	__	__

CAUTION: Disconnect current supply before working on any electrical appliance.

	Yes	No
2. Loosened bolts on motor mount.	__	__
3. Moved motor to side until belt was tight.	__	__
4. Tightened motor mount bolts.	__	__

EVALUATOR'S RESPONSE: Complete the following:

Student's Name: ____

Date Tested: ____________ Performance Rating: 1 2 3 4

Evaluator's Signature: ____

PRODUCT EVALUATION: When tightened, bottom length of belt cannot be pressed toward the middle no more than 3/4 inch, and belt must not bind. (4).

COMMENTS:

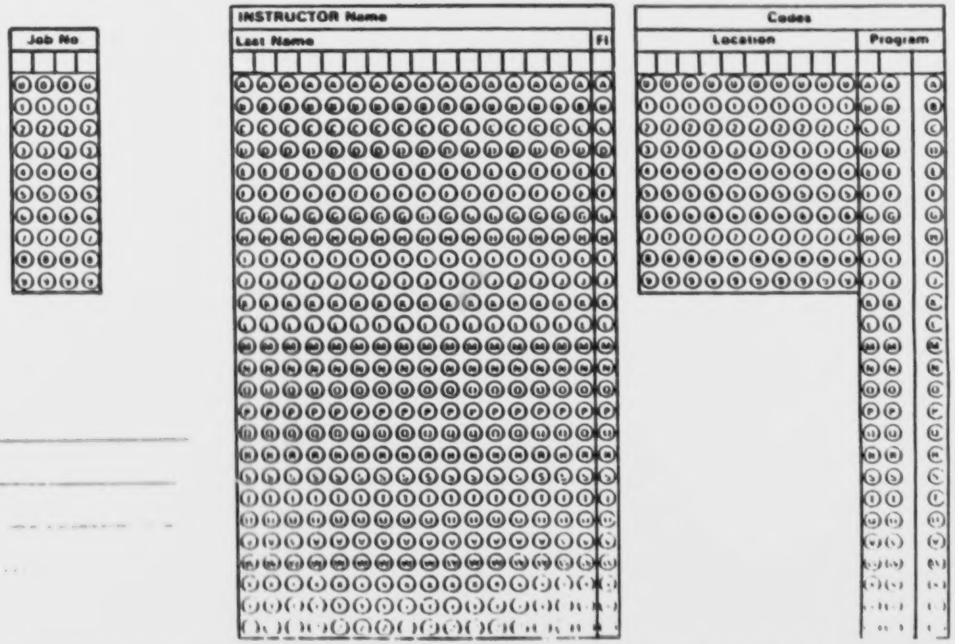
MSU SCORING OFFICE – JOB HEADER SHEET

Instructor:

Print your name (last, first initial) in the boxes and spaces below.

Mark your name in the scanned area below the boxes.

Do not write or mark in the Job Number or the Codes areas. Job Number and Codes will be assigned by the Scoring Office Staff.

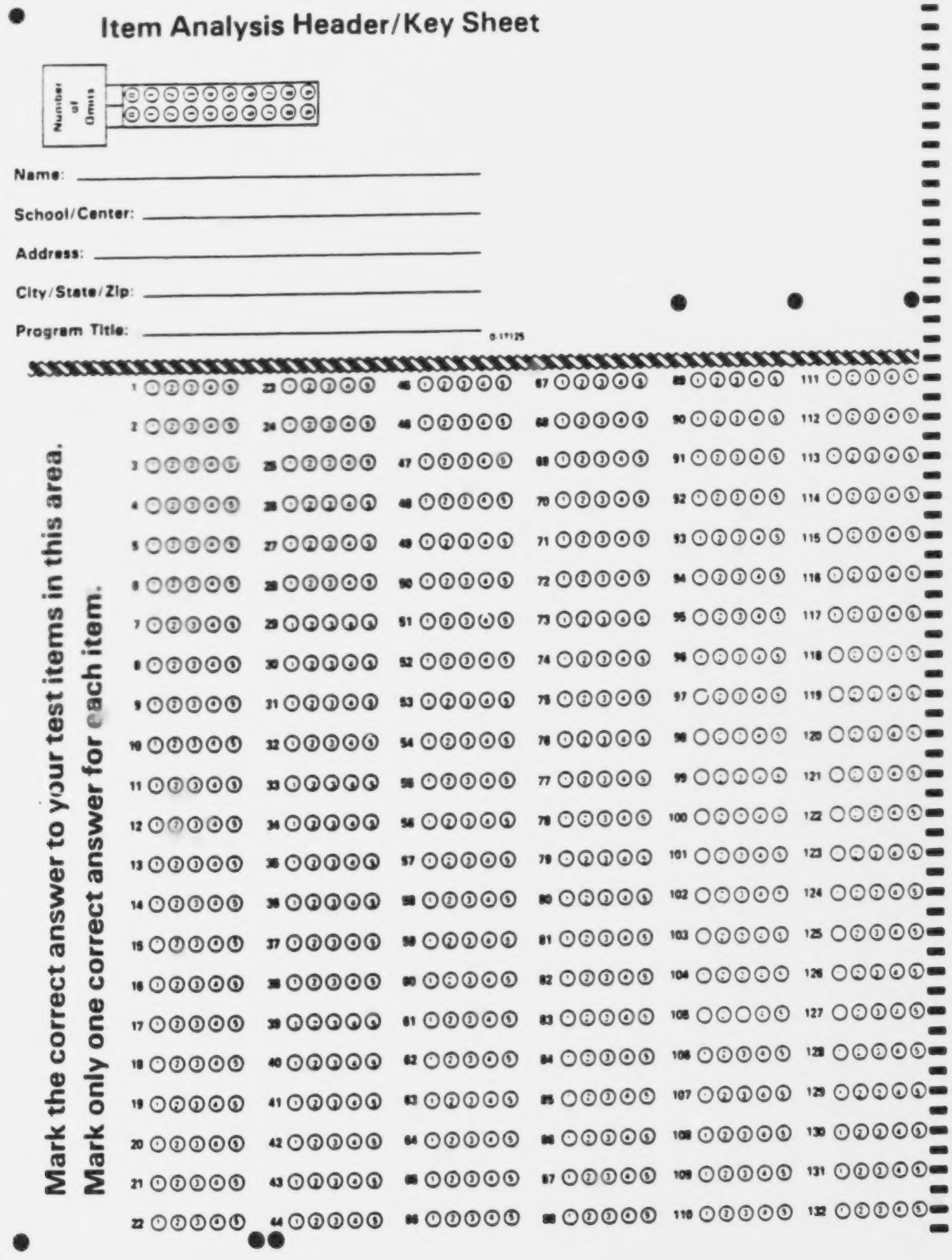

Job No
INSTRUCTOR Name
Last Name
FI
Codes
Location
Program

Name: ____________________

School/Center: ____________________

City/State/Zip: ____________________

Program Title ____________________



Item Analysis Header/Key Sheet

Number of Omits

⓪①②③④⑤⑥⑦⑧⑨	⓪①②③④⑤⑥⑦⑧⑨

Name: ____________________

School/Center: ____________________

Address: ____________________

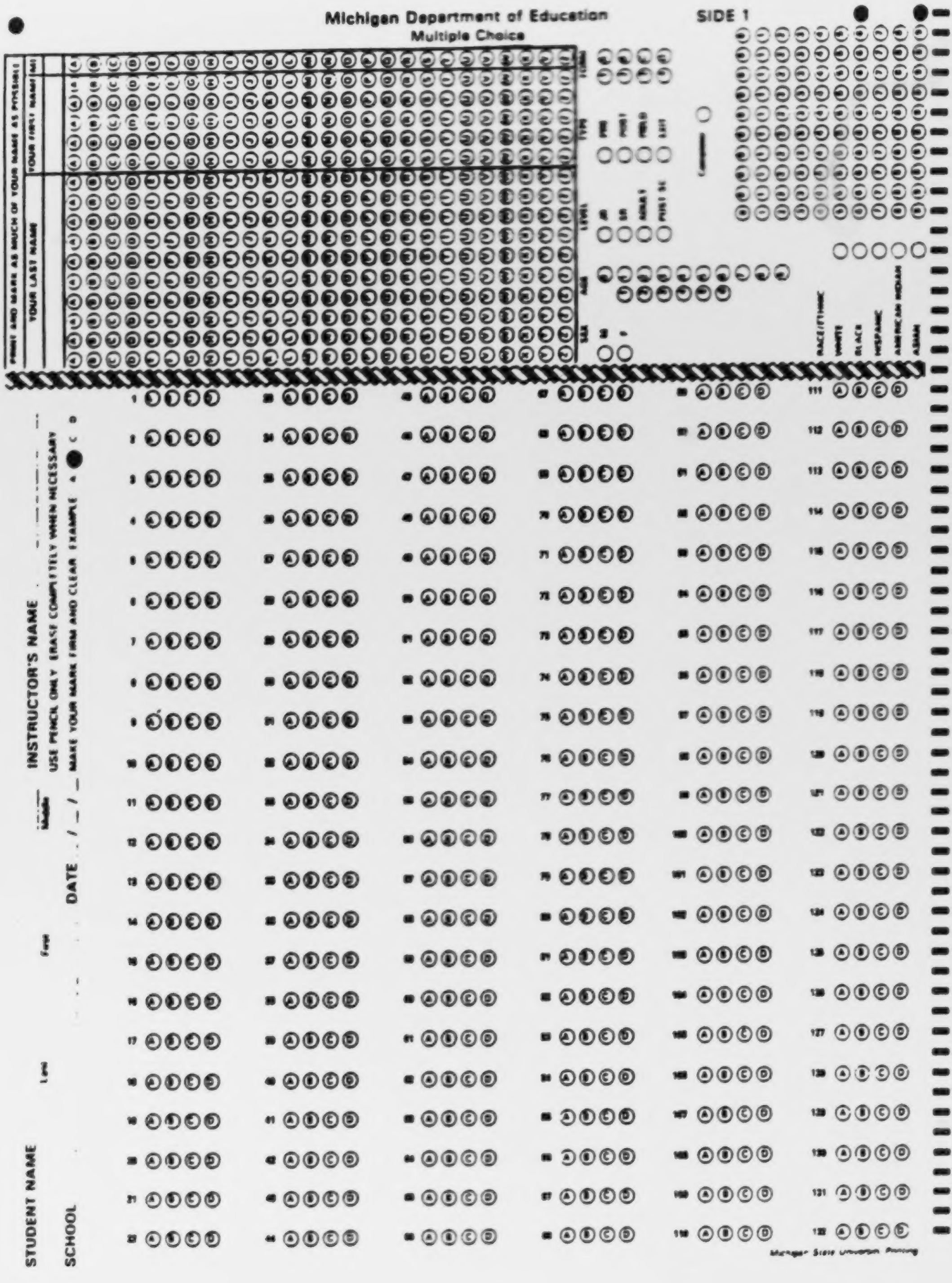
City/State/Zip: ____________________

Program Title: ____________________

0-17125

Mark the correct answer to your test items in this area.
Mark only one correct answer for each item.

1 ①②③④⑤	23 ①②③④⑤	45 ①②③④⑤	67 ①②③④⑤	89 ①②③④⑤	111 ①②③④⑤
2 ①②③④⑤	24 ①②③④⑤	46 ①②③④⑤	68 ①②③④⑤	90 ①②③④⑤	112 ①②③④⑤
3 ①②③④⑤	25 ①②③④⑤	47 ①②③④⑤	69 ①②③④⑤	91 ①②③④⑤	113 ①②③④⑤
4 ①②③④⑤	26 ①②③④⑤	48 ①②③④⑤	70 ①②③④⑤	92 ①②③④⑤	114 ①②③④⑤
5 ①②③④⑤	27 ①②③④⑤	49 ①②③④⑤	71 ①②③④⑤	93 ①②③④⑤	115 ①②③④⑤
6 ①②③④⑤	28 ①②③④⑤	50 ①②③④⑤	72 ①②③④⑤	94 ①②③④⑤	116 ①②③④⑤
7 ①②③④⑤	29 ①②③④⑤	51 ①②③④⑤	73 ①②③④⑤	95 ①②③④⑤	117 ①②③④⑤
8 ①②③④⑤	30 ①②③④⑤	52 ①②③④⑤	74 ①②③④⑤	96 ①②③④⑤	118 ①②③④⑤
9 ①②③④⑤	31 ①②③④⑤	53 ①②③④⑤	75 ①②③④⑤	97 ①②③④⑤	119 ①②③④⑤
10 ①②③④⑤	32 ①②③④⑤	54 ①②③④⑤	76 ①②③④⑤	98 ①②③④⑤	120 ①②③④⑤
11 ①②③④⑤	33 ①②③④⑤	55 ①②③④⑤	77 ①②③④⑤	99 ①②③④⑤	121 ①②③④⑤
12 ①②③④⑤	34 ①②③④⑤	56 ①②③④⑤	78 ①②③④⑤	100 ①②③④⑤	122 ①②③④⑤
13 ①②③④⑤	35 ①②③④⑤	57 ①②③④⑤	79 ①②③④⑤	101 ①②③④⑤	123 ①②③④⑤
14 ①②③④⑤	36 ①②③④⑤	58 ①②③④⑤	80 ①②③④⑤	102 ①②③④⑤	124 ①②③④⑤
15 ①②③④⑤	37 ①②③④⑤	59 ①②③④⑤	81 ①②③④⑤	103 ①②③④⑤	125 ①②③④⑤
16 ①②③④⑤	38 ①②③④⑤	60 ①②③④⑤	82 ①②③④⑤	104 ①②③④⑤	126 ①②③④⑤
17 ①②③④⑤	39 ①②③④⑤	61 ①②③④⑤	83 ①②③④⑤	105 ①②③④⑤	127 ①②③④⑤
18 ①②③④⑤	40 ①②③④⑤	62 ①②③④⑤	84 ①②③④⑤	106 ①②③④⑤	128 ①②③④⑤
19 ①②③④⑤	41 ①②③④⑤	63 ①②③④⑤	85 ①②③④⑤	107 ①②③④⑤	129 ①②③④⑤
20 ①②③④⑤	42 ①②③④⑤	64 ①②③④⑤	86 ①②③④⑤	108 ①②③④⑤	130 ①②③④⑤
21 ①②③④⑤	43 ①②③④⑤	65 ①②③④⑤	87 ①②③④⑤	109 ①②③④⑤	131 ①②③④⑤
22 ①②③④⑤	44 ①②③④⑤	66 ①②③④⑤	88 ①②③④⑤	110 ①②③④⑤	132 ①②③④⑤



Michigan Department of Education
Multiple Choice
SIDE 1

STUDENT NAME Last First Middle
SCHOOL
DATE / /
INSTRUCTOR'S NAME
USE PENCIL ONLY. ERASE COMPLETELY WHEN NECESSARY
MAKE YOUR MARK FIRM AND CLEAR. EXAMPLE A ● C D

PRINT AND MARK AS MUCH OF YOUR NAME AS POSSIBLE
YOUR LAST NAME
YOUR FIRST NAME
MI

SEX
M
F
AGE
LEVEL
JR
SR
ADULT
POST SC
TYPE
PRE
POST
FIELD
EXIT
FORM

RACE/ETHNIC
WHITE
BLACK
HISPANIC
AMERICAN INDIAN
ASIAN

Michigan State University Printing

```
                 * * * * * H E A D E R   A N A L Y S I S * * * * *                 RUNDATE 03/22/88
                 *************************************************

                 ----------------COURSE INFORMATION---------------

                 INSTRUCTOR NAME                        A
                 DEPARTMENT      - AE
                 COURSE NUMBER   - 000
                 SECTION NUMBER  - 000

                 -----------------TEST INFORMATION----------------

                 TEST NUMBER          - 1200
                 TEST DATE            - 03/22/88
                 FORM IDENTIFICATION  - NCS FORMATTED - 5 ANSWER NUMERIC
                 TOTAL ITEMS ON TEST  -   050
                 # OF ITEMS OMITTED   -     0
                 # OF STUDENT SCORES  -    32

--DEFAULT FLAGS--  ---------------STATISTICAL OPTIONS---------------

        *          MEAN DESIRED FOR STANDARD SCORES      - 0050
        *          STD DEV  DESIRED FOR STANDARD SCORES  - 0010
        *          # OF STUDENTS FOR HIGH / LOW GROUPS   - 00008
        *          % OF STUDENTS FOR HIGH / LOW GROUPS   - 27%
        *          CORRECTION FACTOR                     -
        *            ALL STUDENT SCORES REFLECT THE SCANNER SCORE
        *          DIFFICULTY INDEX CALCULATION OPTION   - USE INCORRECT RESPONSES
                   VERIFY STUDENT NAME AND NUMBER        - YES

--DEFAULT FLAGS--  ------------------OUTPUT OPTIONS-----------------

                   PRINT STANDARD FORM            - YES
                   PRINT STATISTICAL FORM         - RESPONSE TABLE ONLY
                   PRINT SUMMARY DATA             - YES
                   PRINT ITEM RESPONSE LABELS     - NO
                   PRINT ALPHA TEST SCORE LIST    - YES
                   PRINT STUDENT # SCORE LIST     - NO
                   PRINT STUDENT FEEDBACK REPORT  - ALPHA LIST

                   * UNDER DEFAULT FLAG INDICATES DEFAULT VALUE ASSUMED

THE INDEX OF DIFFICULTY IS THE PERCENTAGE OF THE TOTAL GROUP MARKING A WRONG ANSWER OR OMITTING THE ITEM

THE INDEX OF DISCRIMINATION IS THE DIFFERENCE BETWEEN THE PERCENTAGE OF THE UPPER GROUP MARKING THE
CORRECT ANSWER AND THE PERCENTAGE OF THE LOWER GROUP MARKING THE CORRECT ANSWER
```

11 Appendix E

```
                              EVALUATION SERVICES
                            RAW SCORE DISTRIBUTION

     RAW                        CUMMULATIVE        PERCENTILE       STANDARD
    SCORE       FREQUENCY        FREQUENCY            RANK            SCORE

     43             2                2                 97             61 7
     42             2                4                 91             60 3
     41             2                6                 84             58 9
     40             2                8                 78             57 5
     39             3               11                 70             56 1
     38             3               14                 61             54 7
     37             2               16                 53             53 3
     36             2               18                 47             51 8
     35             1               19                 42             50 4
     34             2               21                 38             49 0
     33             2               23                 31             47 6
     32             3               26                 23             46 2
     29             1               27                 17             42 0
     27             2               29                 13             39 2
     21             1               30                  8             30 7
     19             1               31                  5             27 9
     13             1               32                  2             19 5

TOTAL ITEMS ON TEST  50          MEAN   34.69         STANDARD DEVIATION   7 10          VARIANCE     50 54
                STANDARD SCORE HAS MEAN OF    50      AND STANDARD DEVIATION OF    10
```

04/06/88

```
                                            EVALUATION SERVICES
                                         ALPHABETIC STUDENT LISTING

   STUDENT               STUDENT    RAW    PERCENTILE   STANDARD   UNANSWERED
    NAME                  NUMBER   SCORE      RANK        SCORE    QUESTIONS

•    1                  00      •   33         31         47 6     012,024.
•    2                  00      •   21          8         30 7
•    3                  00      •   38         61         54 7     029.
•    4                  00      •   34         38         49 0
•    5                  00      •   41         84         58 9
•    6                  00      •   29         17         42 0
•    7                  00      •   39         70         56 1
•    8                  00      •   43         97         61 7
•    9                  00      •   39         70         56 1
•    10                 00      •   34         38         49 0
•    11                 00      •   41         84         58 9
•    12                 00      •   37         53         53 3
•    13                 00      •   32         23         46 2
•    14                 00      •   19          5         27 9     007,026,027,028,029,030,031,032,033,034,035,036,037,038,039,040,041
                                                                   042,043,044,045,046,047,048,049,050.
•    15                 00      •   32         23         46 2
•    16                 00      •   39         70         56 1     012,015.
•    17                 00      •   37         53         53 3
•    18                 00      •   38         61         54 7
•    19                 00      •   13          2         19 5     020,021,022,023,024,025,026,027,028,029,030,031,032,033,034,035,036
                                                                   037,038,039,040,041,042,043,044,045,046,047,048,049,050.
•    20                 00      •   42         91         60 3
•    21                 00      •   42         91         60 3
•    22                 00      •   36         47         51 8
•    23                 00      •   35         42         50 4
•    24                 00      •   27         13         39 2     003.
•    25                 00      •   27         13         39 2     011,012,022.
•    26                 00      •   33         31         47 6     007.
•    27                 00      •   40         78         57 5
•    28                 00      •   43         97         61 7
•    29                 00      •   40         78         57 5
•    30                 00      •   38         61         54 7
•    31                 00      •   36         47         51 8
•    32                 00      •   32         23         46 2

 # NEXT TO RAW SCORE INDICATES INVALID SCANNER SCORE. THE COMPUTED SCORE WAS SUBSTITUTED
 • NEXT TO RAW SCORE INDICATES SCANNER SCORE NOT EQUAL TO COMPUTED SCORE
 • PRECEEDING NAME INDICATES REGISTRARS NAME IS NOT EQUAL TO THE NAME RECORDED ON THE ANSWER SHEET
 # INDICATES INVALID STUDENT NUMBER OR THAT THE NUMBER IS NOT IN THE CURRENT REGISTRAR FILE
```

25

04/06/88

```
                      EVALUATION SERVICES SCORING FEEDBACK REPORT

                         50 ITEMS ON TEST 1200   03 1988

                      00        *  RAW SCORE   33   PERCENTILE  31    STANDARD SCORE   47.6

001. 4  4 * 002. 1  1 * 003. 3  3 * 004. 1  1 * 005. 1--3 * 006. 4--1 * 007. 4  4 * 008. 4--3 * 009. 3  3
010. 1  1 * 011. 3  3 * 012.  --4 * 013. 1--4 * 014. 1  1 * 015. 4  4 * 016. 4  4 * 017. 2--4 * 018. 2  2
019. 3  3 * 020. 4  4 * 021. 4  4 * 022. 4  4 * 023. 2  2 * 024.  --3 * 025. 3  3 * 026. 4  4 * 027. 3  3
028. 2  2 * 029. 1  1 * 030. 4  4 * 031. 1--3 * 032. 1--3 * 033. 3--4 * 034. 1--2 * 035. 2--3 * 036. 3  3
037. 4  4 * 038. 4--3 * 039. 2--1 * 040. 2  2 * 041. 2--3 * 042. 2  2 * 043. 4  4 * 044. 4--2 * 045. 2  2
046. 4  4 * 047. 2  2 * 048. 4--2 * 049. 4  4 * 050. 3  3

           TEST ITEM NUMBER FOLLOW BY STUDENT RESPONSE FOLLOWED BY CORRECT RESPONSE
           *  NEXT TO STUDENT NUMBER INDICATES THAT THE NUMBER IS NOT ON CURRENT REGISTRAR FILE.
```

04/06/88

```
STANDARD FORM          50 ITEMS      PERCENTAGES     UPPER  27%   MIDDLE  46%   LOWER  27%                32 STUDENTS
                                  STUDENTS PER GROUP           8              16             8

  ITEM  KEY  •       1       •       2       •       3       •       4       •       5       •     OMIT      •    ERROR     •    DIFF    DISC
             • U    M    L   • U    M    L   • U    M    L   • U    M    L   • U    M    L   • U    M    L   • U    M    L   •
-----------------------------------------------------------------------------------------------------------------------------------------------
    1    4   •   0    6   75 •   0    0    0 •   0    0    0 • 100   94   25 •   0    0    0 •   0    0    0 •   0    0    0 •     22      75
    2    1   • 100   88   75 •   0   13    0 •   0    0   25 •   0    0    0 •   0    0    0 •   0    0    0 •   0    0    0 •     13      25
    3    3   •   0    0    0 •   0    0    0 • 100  100   88 •   0    0    0 •   0    0    0 •   0    0   13 •   0    0    0 •      3      12
    4    1   •  88   69   75 •   0    0    0 •  13   31   25 •   0    0    0 •   0    0    0 •   0    0    0 •   0    0    0 •     25      13
    5    3   •  25   50   75 •   0   19   25 •  75   25    0 •   0    6    0 •   0    0    0 •   0    0    0 •   0    0    0 •     69      75
             •               •               •               •               •               •               •              •
-----------------------------------------------------------------------------------------------------------------------------------------------
    6    1   •  50   31   38 •   0    0    0 •   0    6   25 •  50   63   38 •   0    0    0 •   0    0    0 •   0    0    0 •     63      12
    7    4   •   0    6    0 •   0    6    0 •   0    0    0 • 100   81   88 •   0    0    0 •   0    6   13 •   0    0    0 •     13      12
    8    3   •   0    0    0 •   0    0    0 • 100   94   88 •   0    6   13 •   0    0    0 •   0    0    0 •   0    0    0 •      6      12
    9    3   •   0    6    0 •   0    0    0 • 100   88   88 •   0    6   13 •   0    0    0 •   0    0    0 •   0    0    0 •      9      12
   10    1   •  75   75   88 •  13    0   13 •   0   13    0 •  13   13    0 •   0    0    0 •   0    0    0 •   0    0    0 •     22     -13
             •               •               •               •               •               •               •              •
-----------------------------------------------------------------------------------------------------------------------------------------------
   11    3   •   0    0   25 •   0    0    0 • 100   94   63 •   0    6    0 •   0    0    0 •   0    0   13 •   0    0    0 •     13      37
   12    4   •  38   38   13 •  25   50   50 •  25    0   25 •  13    0    0 •   0    0    0 •   0   13   13 •   0    0    0 •     97      13
   13    4   • 100   81   75 •   0   13    0 •   0    0    0 •   0    6   25 •   0    0    0 •   0    0    0 •   0    0    0 •     91     -25
   14    1   •  88   88   88 •  13    6    0 •   0    0   13 •   0    6    0 •   0    0    0 •   0    0    0 •   0    0    0 •     13       0
   15    4   •   0    6   13 •   0    6    0 •   0    6    0 • 100   75   88 •   0    0    0 •   0    6    0 •   0    0    0 •     16      12
             •               •               •               •               •               •               •              •
-----------------------------------------------------------------------------------------------------------------------------------------------
   16    4   •   0    0    0 •   0    0    0 •   0    0    0 • 100  100  100 •   0    0    0 •   0    0    0 •   0    0    0 •      0       0
   17    4   •   0    0    0 •  38   31   25 •   0    0    0 •  63   69   75 •   0    0    0 •   0    0    0 •   0    0    0 •     31     -12
   18    2   •  50   19   13 •  50   81   63 •   0    0    0 •   0    0   25 •   0    0    0 •   0    0    0 •   0    0    0 •     31     -13
   19    3   •   0    0    0 •   0    6   13 • 100   94   88 •   0    0    0 •   0    0    0 •   0    0    0 •   0    0    0 •      6      12
   20    4   •   0    0   25 •   0    6    0 •   0    0    0 • 100   94   63 •   0    0    0 •   0    0   13 •   0    0    0 •     13      37
             •               •               •               •               •               •               •              •
-----------------------------------------------------------------------------------------------------------------------------------------------
   21    4   •   0    0    0 •   0    0    0 •   0    0    0 • 100  100   88 •   0    0    0 •   0    0   13 •   0    0    0 •      3      12
   22    4   •   0    6   13 •   0    6    0 •   0    0   13 • 100   88   50 •   0    0    0 •   0    0   25 •   0    0    0 •     19      50
   23    2   •   0    0   13 • 100   88   63 •   0    6   13 •   0    6    0 •   0    0    0 •   0    0   13 •   0    0    0 •     16      37
   24    3   •  13   19   13 •  13    6   38 •  50   38   13 •  25   31   25 •   0    0    0 •   0    6   13 •   0    0    0 •     66      37
   25    3   •   0    0    0 •   0    0   13 • 100   94   63 •   0    6   13 •   0    0    0 •   0    0   13 •   0    0    0 •     13      37
             •               •               •               •               •               •               •              •
-----------------------------------------------------------------------------------------------------------------------------------------------
   26    4   •   0    0   13 •   0    0   25 •   0    0    0 • 100  100   38 •   0    0    0 •   0    0   25 •   0    0    0 •     16      62
   27    3   •   0    0    0 •  13   19   38 •  88   81   38 •   0    0    0 •   0    0    0 •   0    0   25 •   0    0    0 •     28      50
   28    2   •  13    0   13 •  50   69   25 •  38   31   38 •   0    0    0 •   0    0    0 •   0    0   25 •   0    0    0 •     47      25
   29    1   • 100   69   50 •   0    6    0 •   0   19   25 •   0    0    0 •   0    0    0 •   0    6   25 •   0    0    0 •     28      50
   30    4   •   0    0    0 •   0    0    0 •   0   19   13 • 100   81   63 •   0    0    0 •   0    0   25 •   0    0    0 •     19      37
             •               •               •               •               •               •               •              •
-----------------------------------------------------------------------------------------------------------------------------------------------
   31    3   •   0   19   25 •   0   13    0 • 100   63   50 •   0    6    0 •   0    0    0 •   0    0   25 •   0    0    0 •     31      50
   32    3   •   0    6    0 •  13    6   13 •  88   81   38 •   0    6   25 •   0    0    0 •   0    0   25 •   0    0    0 •     28      50
   33    4   •   0    0    0 •   0    0    0 •  13   25   38 •  88   75   38 •   0    0    0 •   0    0   25 •   0    0    0 •     31      50
   34    2   •  13   19   13 •  50   63   50 •  38   19   13 •   0    0    0 •   0    0    0 •   0    0   25 •   0    0    0 •     44       0
   35    3   •   0    6    0 •   0   25   38 • 100   63   25 •   0    6   13 •   0    0    0 •   0    0   25 •   0    0    0 •     38      75
             •               •               •               •               •               •               •              •
-----------------------------------------------------------------------------------------------------------------------------------------------
   36    3   •   0    0   13 •   0    6   13 • 100   94   50 •   0    0    0 •   0    0    0 •   0    0   25 •   0    0    0 •     16      50
   37    4   •   0    0    0 •  38   38    0 •   0    0   25 •  63   63   50 •   0    0    0 •   0    0   25 •   0    0    0 •     41      13
   38    3   •   0    0    0 •   0    6   13 • 100   88   63 •   0    6    0 •   0    0    0 •   0    0   25 •   0    0    0 •     16      37
   39    1   •  63   38   25 •  38   38   25 •   0    6    0 •   0   19   25 •   0    0    0 •   0    0   25 •   0    0    0 •     59      38
   40    2   •   0    6   13 • 100   63   13 •   0   13   25 •   0   19   25 •   0    0    0 •   0    0   25 •   0    0    0 •     41      87
             •               •               •               •               •               •               •              •
-----------------------------------------------------------------------------------------------------------------------------------------------
   41    3   •  25   25   13 •  13   31   25 •  63   44   25 •   0    0   13 •   0    0    0 •   0    0   25 •   0    0    0 •     56      38
   42    2   •   0   13    0 •  50   44   25 •   0    6   25 •  50   38   25 •   0    0    0 •   0    0   25 •   0    0    0 •     59      25
   43    4   •   0    0   13 •   0    0   38 •   0    6    0 • 100   94   25 •   0    0    0 •   0    0   25 •   0    0    0 •     22      75
   44    2   •  13    6   13 •  88   75   38 •   0    0    0 •   0   19   25 •   0    0    0 •   0    0   25 •   0    0    0 •     31      50
   45    2   •   0    6   13 •  88   81   63 •  13    0    0 •   0   13    0 •   0    0    0 •   0    0   25 •   0    0    0 •     22      25
             • U    M    L   • U    M    L   • U    M    L   • U    M    L   • U    M    L   • U    M    L   • U    M    L   •
-----------------------------------------------------------------------------------------------------------------------------------------------
```

```
ITEM  61 OF  83        THE CORRECT RESPONSE IS 2

                       ITEM RESPONSE PATTERN

               1    2    3    4    5  OMIT ERROR TOTAL    INDEX OF DIFFICULTY         21
                                                          INDEX OF DISCRIMINATION     18

UPPER   27     1    9    1    0    0    0    0    11
              9%  82%   9%   0%   0%   0%   0%  100%

MIDDLE  46     2   17    1    0    0    0    0    20
             10%  85%   5%   0%   0%   0%   0%  100%

LOWER   27     3    7    1    0    0    0    0    11
             27%  64%   9%   0%   0%   0%   0%  100%

  TOTAL        6   33    3    0    0    0    0    42
             14%  79%   7%   0%   0%   0%   0%  100%


ITEM  62 OF  83        THE CORRECT RESPONSE IS 2

                       ITEM RESPONSE PATTERN

               1    2    3    4    5  OMIT ERROR TOTAL    INDEX OF DIFFICULTY         10
                                                          INDEX OF DISCRIMINATION     36

UPPER   27     0   11    0    0    0    0    0    11
              0% 100%   0%   0%   0%   0%   0%  100%

MIDDLE  46     0   20    0    0    0    0    0    20
              0% 100%   0%   0%   0%   0%   0%  100%

LOWER   27     1    7    2    1    0    0    0    11
              9%  64%  18%   9%   0%   0%   0%  100%

  TOTAL        1   38    2    1    0    0    0    42
              2%  90%   5%   2%   0%   0%   0%   99%


ITEM  63 OF  83        THE CORRECT RESPONSE IS 1

                       ITEM RESPONSE PATTERN

               1    2    3    4    5  OMIT ERROR TOTAL    INDEX OF DIFFICULTY         55
                                                          INDEX OF DISCRIMINATION     37

UPPER   27     8    2    1    0    0    0    0    11
             73%  18%   9%   0%   0%   0%   0%  100%

MIDDLE  46     7    5    6    2    0    0    0    20
             35%  25%  30%  10%   0%   0%   0%  100%

LOWER   27     4    5    2    0    0    0    0    11
             36%  45%  18%   0%   0%   0%   0%   99%

  TOTAL       19   12    9    2    0    0    0    42
             45%  29%  21%   5%   0%   0%   0%  100%
```

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Legal Issues Concerning Competency-Based Testing

Presented
by

Thomas H. Fisher
Florida

Monday, April 11
2:00 pm - 3:00 pm

Implementing an Instructional Validity Study of the Florida High School Graduation Test

Thomas H. Fisher
Florida Department of Education

The *Debra P. v. Turlington* (1979) court case was brought as a comprehensive challenge to the Florida high school graduation test (the State Student Assessment Test, Part II, or the SSAT-II). The testing program and the *Debra P.* case previously have been described in the professional literature (Fisher, 1978; McClung, 1979; Tractenberg, 1979; Turlington, 1979, 1981).

One of the more interesting dimensions of the case for educational measurement specialists is the courts' focus on the instructional validity of the test. Instructional validity was perhaps first used in the professional literature by McClung (1978), who used the term to mean "whether the schools are providing students with instruction in the knowledge and skills measured by the test" (p. 397).

Thomas H. Fisher has been Director, Student Assessment Section, Florida Department of Education, since 1976, and is responsible for Florida's student minimum competency testing program in grades K-12 and for the Florida Teacher Certification Examination. He has served as advisor on testing issues in several states. He has authored numerous publications and is a frequent speaker on testing and accountability issues at professional meetings.

In *Debra P.*, the Fifth Circuit Court of Appeals indicated that the record was not clear as to whether or not the test was a fair test of what was taught (*Debra P. v. Turlington*, 1981). Thus, it was necessary for Florida to conduct an instructional validity study of the test. In this article I will describe that study and the subsequent court decision in May 1983 which permitted the graduation requirement to be fully implemented.

Conceptual Framework for the Study

The Fifth Circuit Court of Appeals did not clarify how Florida should demonstrate instructional validity for the SSAT-II. Therefore, the State decided to define instructional validity and then design the study around that definition. The State relied on W. James Popham and Elanna Yalow, IOX Associates, Culver City, California, for assistance in these steps.

Instructional validity of the SSAT-II was defined as "the extent to which the test contained tasks for which students have been given preparation" (Popham & Yalow, 1982, p. 2). The definition implies that instructional validity of a test is a matter of degree. It is not something that can be quantified and compared to existing professional standards.

The Florida graduation test is objective-referenced and measures 13 mathematics skills and 11 communication skills. Thus, the validity study focused on the instruction students received in 24 specific areas. The other instruction students received was not relevant to the issue of the graduation test except to the extent that it supported and extended the instruction directly relevant to the SSAT-II.

To summarize, the Florida instructional validity study was designed to determine the degree to which students were given proper preparation to pass the graduation test. It was a study relying on professional judgment to interpret the data collected. It focused on instruction directly applicable to the tested skills, not on skills that were indirectly related or prerequisite to skills on the test.

Implementation of the Study

The instructional validity study completed in Florida had six separate but related components. The most concentrated effort took place from about June 1982 through December 1982. The study depended on the idea of convergent proof that is, the six components would converge to provide evidence of instructional validity. No single component would necessarily provide sufficient information. Each component is described below.

Principals' Dissemination of the SSAT-II Skills. A test cannot have instructional validity unless the skills have been properly disseminated and adopted into the curriculum. Therefore, the first component of the study consisted of a survey of all junior and senior high school principals to determine if they had received copies of the required skills and if they had taken steps to incorporate the skills into their high school curriculum. Each principal was asked to sign a form indicating whether he or she had done this.

Student Remediation Study. Students in Florida have five opportunities to take and pass the required graduation test. For the class of 1983, the first opportunity came in March 1981. The Department of Education sent each school district a list of the students who had not passed the test on the first try and asked the districts to indicate the current status of each student. The district indicated whether the student had been provided remedial instruction, the type of remedial instruction provided, whether the student had refused remediation, or if the student had left school. The survey was repeated each time the test was administered to the class of 1983.

District Self-Report. Each of the 67 school districts in Florida was asked in July 1982 to complete a self-report of their instructional design for teaching the required skills. The report had the following six components:

1. SSAT-II Skills-by-Grade Summary. This summary was a matrix on which local school district officials indicated the grade levels at which the skills were being taught and were being taught to mastery.
2. Major SSAT-II Instructional Program Variations. This form provided local district officials the opportunity to describe any instructional program that was a significant variation from the general efforts described in the skills matrix.
3. Description of SSAT-II Remedial Programs. This form requested each district to describe the instruction available to students likely to fail or who had failed the graduation test.
4. Summary of SSAT-II Staff Development Activities. This form required local district officials to describe any staff development program leading to increased ability to teach the required SSAT-II skills.
5. Instructional Materials Anaylsis for SSAT-II Skills. This form requested a description of the major materials used by the district to teach the SSAT-II skills.
6. Additional SSAT-II District Activities. This form permitted the districts to describe any activities that were relevant but were not described in the first five forms.

Teacher Survey. A teacher survey was developed and sent to approximately 65,000 2nd through 12th grade teachers in Florida's public schools. The survey asked teachers if they had taught the SSAT-II skills and if they had taught them sufficiently to enable students to master the skills if they applied reasonable effort. The surveys were administered anonymously. The results were summarized for the state and for each district.

On-site Visitations. One or more teams of one Department of Education curriculum specialist and two local district educators visited a stratified, random sample of schools in every district. The teams were to (a) judge the accuracy of the district's self-report; (b) determine if there was evidence of instruction on the SSAT-II skills; and (c) provide any impressions gained during the district visit about the quality of the district's efforts to instruct students on the SSAT-II skills. All team members signed the final report of the visitation.

Student Survey. As part of the on-site visitation, the teams were asked to administer to a sample of students a survey asking whether they had been taught the SSAT-II skills in school. Students responded anonymously after having read several sample questions with the correct answers for each skill. Approximately 5,000 students completed the surveys.

As can be surmised, the finished study was voluminous. Copies of all reports were distributed to the court, the witnesses, and the attorneys. Back-up printouts and all original documents were retained for use if necessary.

The 1983 *Debra P.* Court Decision

The original trial judge, George C. Carr, conducted a hearing in the spring of 1983 on the issue of the instructional validity of the SSAT-II. The hearing was conducted through the testimony of expert witnesses. Witnesses for the State described the available evidence gathered by the State and concluded that the SSAT-II skills were being taught and that the graduation requirement could be implemented in all public schools with the class of 1983. Witnesses for the plaintiffs expressed their concern about the adequacy of the evidence presented by the defendants and questioned the conclusions drawn by the defendants' witnesses.

Judge Carr was persuaded by the State's presentation. He was convinced that the Educational Accountability Act is a "driving force in all of Florida's public schools" (*Debra P. v. Turlington*, 1983, at 18). He concluded that the graduation test could be implemented with the class of 1983.

The court acknowledged the existence of a debate within the professional testing community about instructional validity. Carr said in his final ruling, "this court has been called upon to settle not only a legal argument but also a professional dispute" (*Debra P. v. Turlington*, 1983, at 12).

Summary and Conclusions

The *Debra P. v. Turlington* case has had significant influence on minimum competency testing programs in the public schools. The courts required the State of Florida to demonstrate that its graduation test had instructional validity. Florida responded by gathering substantial evidence from different sources, forming a web of supporting information that showed that students were given the opportunity to learn what they were required to learn.

The court did not require Florida to prove that every student received identical instruction. As Judge Carr stated,

> *If the burden asserted by the plaintiffs were accepted, the State would never be able to exercise [the right to impose the diploma sanction] because instructional validity could never be proven as to every student. Such a result is not mandated by the Constitution or the Court of Appeals.* (Debra P., *1983, at 21-22)*

One should not conclude that the Florida model establishes the threshold of evidence expected by the courts in such cases. Others facing the same challenge should review the Florida procedures and adapt them to their unique circumstances. The most important conclusion is that procedures are available to demonstrate that required skills are being taught. Educators need not avoid initiating competency programs out of fear that the instructional validity issue is unmanageable.

References

Debra P. v. Turlington, 474 F. Supp. 244 (M.D. Florida 1979).

Debra P. v. Turlington, 644 F. 2d 397 (5th Cir. 1981).

Debra P. v. Turlington, Case 78-892, Memorandum Opinion and Order (M.D. Florida, May 4, 1983).

Fisher, T. H. Florida's Approach to Competency Testing. *Phi Delta Kappan*, 1978, *59*, 599-602.

McClung, M. S. Are competency testing programs fair? Legal? *Phi Delta Kappan*, 1978, *59*, 397-400.

McClung, M. S. *ECS Law and Education Center footnotes*. Denver, Colo.: Education Commission of the States, November 1979.

Popham, W. J., & Yalow, E. *Determining the instructional validity of the SSAT-II*. Culver City, Calif.: IOX Assessment Associates, September 14, 1982.

Tractenberg, P. L. *Legal implications of minimum competency testing: Debra P. and beyond*. Denver, Colo.: Education Commission of the States, October 15, 1979.

Turlington, R. D. Good news from Florida: Our minimum competency program is working. *Phi Delta Kappan*, 1979, *60*, 649-651.

Turlington, R. D. Florida's testing program: A firm foundation for improvement. *Phi Delta Kappan*, 1981, *62*, 204. ■

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Occupational Testing -- What We Do In Oklahoma

Presented
by

Brenda Stacy
Oklahoma

Carousel Session

THE COGNITIVE TEST

The cognitive test is a collection of simple multiple choice items. These test items are performance-based in that they relate to actual tasks to be performed in a specific occupation. Cognitive items are directed toward recall of basic knowledge and require little application by the student.

Each cognitive test item is comprised of the following parts:

Stem (Question)
Distractor (Incorrect answer)
Distractor (Incorrect answer)
Distractor (Incorrect answer)
Key (Correct answer)

Example from EMT Battery:

---

1. What should be suspected if the patient's skin appears pale, white, ashen, or gray:

   A. carbon monoxide poisoning
   B. hepatitis or liver dysfunction
   C. insufficient circulation or shock
   D. respiratory insufficiency

---

correct answer = C

The key and distractors are placed in alphabetical order, therefore, the position of the key in the A, B, C, D sequence will vary from item to item.

07/10/86

RESIDENTIAL CARPENTRY
FINISH CARPENTER'S TEST (EXTERIOR)

INSTRUCTIONS:

Each of the items provided on this test is followed by four possible responses. Choose the one which best answers the question or completes the statement. WITH PENCIL ONLY, mark your selection on your answer sheet. DO NOT WRITE IN THIS TEST BOOKLET. An example of proper marking is provided on your answer sheet.

1. What is the minimum distance that cornice fascia should project below the soffit:

   A. 1/4"
   B. 1/2"
   C. 3/4"
   D. 1"

2. How many sheets of 4' x 8' x 1/4" plywood are required for soffits on a hip roof house that has a perimeter measurement of 320' and an overhang of 2':

   A. 10
   B. 20
   C. 30
   D. 40

3. Estimate the number of sheets of 4 x 8 siding needed for the exterior walls of a house 48' long, 36' wide, with 8' walls, and a 2' overhang along a hip roof:

   A. 36
   B. 40
   C. 42
   D. 52

4. How many 4 x 8 sheets of styrofoam are needed to cover the exterior walls of a house with a width of 26', a length of 56' and a height of 8':

   A. 21
   B. 41
   C. 52
   D. 82

5. How many sheets of 4' x 8' x 1/4" soffit board are needed to construct the soffit board under the overhang for a home that is 52' long, 32' wide, has 8' walls, a hip roof with a 2' overhang and a horizontal box cornice:

   A. 10
   B. 12
   C. 14
   D. 15

6. How many sheets of 4' x 8'siding are needed for the exterior walls of a home that is 62' long, 24' wide, that has 8' walls and a hip roof:

   A. 39
   B. 43
   C. 46
   D. 54

7. What is the MINIMUM clearance that carpenters allow between the bottom of plywood panel siding and the finished grade:

   A. 2"
   B. 4"
   C. 6"
   D. 8"

8. In what pattern is board and batten siding usually applied:

   A. diagonally
   B. horizontally
   C. in a diamond pattern
   D. vertically

9. What is the framing member to which gable fascia is attached:

   A. the barge rafter
   B. the gable stud
   C. the lookout
   D. the rake

10. What is the correct term for exterior siding that is thicker at the bottom than at the top:

    A. bevel
    B. board and batten
    C. drop
    D. panel

11. What untreated wood resists weathering best when used for exposed decks and porches:

    A. cedar
    B. fir
    C. oak
    D. pine

12. What location in the eaves provides both the surface area and the air flow suitable for attic vents:

    A. in the fascia
    B. in the frieze
    C. in the ledger
    D. in the soffit

13. What is the term for the band of wood to which look outs and soffit are attached:

    A. frieze
    B. header
    C. ledger
    D. plate

14. What is a major advantage that wood windows have over metal windows for a homeowner:

    A. there is less heat loss through wood windows
    B. they are easier to install than metal windows
    C. they are less expensive than metal windows
    D. they require less maintenance than metal windows

15. What is the term for a type of window that is hinged at the side and swings outward by means of a crank or lever:

    A. awning
    B. casement
    C. double hung
    D. hopper

16. What is the standard height for a residential entrance door:

    A. 6'-6"
    B. 6'-8"
    C. 6'-10"
    D. 7'-0"

17. How wide should the jambs of an exterior door be:

A. as wide as the rough frame
B. as wide as the rough frame plus the exterior sheathing
C. as wide as the rough frame plus the interior sheathing
D. as wide as the rough frame plus the interior sheathing and the exterior sheathing

18. How many squares of asphalt shingles will it take to cover the roof of a building that is 21' wide and 45' long, that has an 18" eave and rake projection, and has a 6/12 pitch (disregarding the ridge caps, starter course and rake starters):

A. 1.3
B. 9.5
C. 13.0
D. 130.0

19. About how many pounds per square do standard two and three tab asphalt shingles currently weigh:

A. 23
B. 100
C. 235
D. 350

20. How many nails will it take to apply sixteen squares of asphalt shingles:

A. 8
B. 16
C. 32
D. 40

21. Which of the listed materials is BEST suited for use as roof underlayment:

A. 1/2" wafer board
B. 1 x 4 lumber
C. 2 x 4 lumber
D. 4 x 8 masonite

22. How much space should be allowed for expansion between standard wood shingles:

A. 1/4"
B. 3/4"
C. 1"
D. 2"

23. How many bundles of standard wood shingles will it take to cover a roof that requires ten squares of shingles:

A. 20
B. 30
C. 40
D. 50

24. What nailing pattern is used with shake shingles:

A. 1 nail is placed on each edge
B. 2 nails are used, one on the top edge and one on the bottom
C. 4 nails are placed evenly across the middle of the shingle
D. 5 nails are used, one on each edge and one in the middle

25. If you are applying asphalt shingles around a pipe vent,what course of shingles will fit over the top of the vent pipe's flashing:

A. the first course(the course immediately beneath the pipe)
B. the second course(the one cut and fit over the top of the pipe)
C. the third course(the one applied after the flashing is installed)
D. none of courses fit over the flashing(the shingles fit under flashin

07/10/86

RESIDENTIAL CARPENTRY
FINISH CARPENTER'S TEST (EXTERIOR)

1.	B	K0103
2.	B	K0106
3.	C	K0109
4.	B	K0113
5.	B	K0117
6.	B	K0122
7.	C	K0203
8.	D	K0208
9.	A	K0212
10.	A	K0217
11.	A	K0301
12.	D	K0402
13.	C	K0405
14.	A	L0101
15.	B	L0202
16.	B	M0101
17.	D	M0304
18.	C	N0101
19.	C	N0105
20.	D	N0108
21.	A	N0204
22.	A	N0302
23.	C	N0306
24.	A	N0311
25.	C	N0316

THE SCENARIO TEST

The scenario test consists of "sets" of multiple choice items. Each set is prefaced by a situation statement and the multiple choice items that follow are related to each other in subject.

Scenario items allow students to make performance-based decisions at a higher level of application than cognitive items. The reasoning of appropriate responses to specific situations is valuable in preparing the student for the occupational setting.

Example from Business and Office Battery:

Tammy is attempting to retrieve a file from one of the department's file drawers. It would be easier if there were not so many misfiled and missing folders. She wondered if any of the files were lying on someone's desk, unused. Also, after working in this department for a year, she is still unsure which file contains the information she needs.

1. The current filing system requires that Tammy look up the numeric code of a company or client in a cross-reference before going to the file drawer. The best alternative to this numeric filing system would be:

   A. index files alphabetically by company or individual name
   B. index files by subject
   C. index files geographically
   D. leave filing system as it is

2. Tammy wants to solve the problem of locating missing files. She decides that the best method of finding these files is to use:

   A. an out guide or out folder in place of the folder
   B. a primary guide to replace a file folder
   C. a requisition card to replace a file folder
   D. a substitution card to replace the file folder

3. Finally, Tammy would like to find a simple solution to the problem of misfiled folders. The most feasible solution is to:

   A. call an office meeting telling the staff to file folders correctly
   B. color key guide and folder labels in corresponding colors
   C. cross reference all file folders
   D. label each file drawer by subject

---

correct answers: 1 = A, 2 = A, 3 = B

As with cognitive test items, the distractors are placed in alphabetical order and the position of the key within each sequence will vary.

07/09/86

CHILD CARE SAMPLE SCENARIO TEST
CHILD CARE TEACHER

INSTRUCTIONS:

These test items contain a situation statement followed by several related questions. First, carefully read the situation statement. Using this information, answer the related questions. Each has four possible responses. Choose the response that best answers that question or completes that statement. WITH PENCIL ONLY, mark your selection on your answer sheet. DO NOT WRITE IN THIS BOOKLET. An example of proper marking is provided on your answer sheet.

It is 12:00 and time for lunch at the Gingerbread Day Care Center. You are the teacher in charge of supervising this routine. Everything seems to be running smoothly with the exception of a few normal mealtime problems. Sheila, age 4, has decided she needs to stand while eating. Carl is a dawdler. He eats rapidly at the beginning and as soon as his hunger is satisfied, he dawdles through the remainder of the meal, picking and playing with the food until the meal is finished. Also, you have noticed that soon after the meal is served the toddlers fall asleep at the table before they finish eating.

1. The Director of the center has asked you to suggest a solution for the problem concerning the toddlers. What could be done:

   A. let the toddlers sleep through lunch
   B. serve the toddlers lunch after nap
   C. serve the toddlers lunch earlier
   D. wake the toddlers up to eat lunch

2. What should you do about Carl:

   A. do not let Carl eat
   B. remove his plate as soon as he finishes
   C. stand Carl in the corner
   D. tell Carl if he continues he will not play outside

3. How should you handle the problem with Sheila:

   A. call Sheila's parents about the problem
   B. report the problem to your Director
   C. tell her to leave the table until she is ready to sit
   D. tell her to stand in the corner

Two-year old Joshua has been at your day care center for only two months. He is a chunky little blonde who loves school and participates well in activities. He is a loving child who gives frequent hugs to teachers and children. However, Joshua bites. If someone has a truck or block he wants, he bites the person and takes the toy. At other times, he walks up to a child, gives him a hug, and sinks his teeth into their cheek. As the teacher, your response to Joshua's biting has always been to tell him how much he has hurt the other child and to scold him for biting. He is reminded that he wouldn't like his friends to bite him. He is usually very apologetic to his victim. His concern does not last long, however. He often resumes the biting within a very short time.

4. You are concerned about the biting problem in your classroom. What can you do to prevent frequent occurrences:

   A. bite the child back so he learns what it feels like
   B. do nothing; accept the fact that 2-year olds bite and will grow out of it
   C. isolate the child until he can control his biting
   D. move the furniture around in the day care center

5. Which activity would help Joshua control his biting:

   A. a field trip with older children to the doctor's office
   B. a relay race
   C. listening to a story about rock information
   D. make pop corn and taste it

6. What should you say to Joshua if his biting continues:

   A. "I don't like biting. You're a bad boy."
   B. "If you don't stop biting, I will have to tell your mother."
   C. "No. It hurts when you bite."
   D. "Tell your friend you're sorry."

07/09/86

CHILD CARE SAMPLE SCENARIO TEST
CHILD CARE TEACHER

School-age children tend to be faced with many crisis situations. Helping a school-age child face crisis situations and adjust favorably is a goal that all caregivers of school-age children have. Described below are several crisis situations that school-aged children are faced with.

Situation I

Bobby's little dog was run over and killed by a car. Bobby is having problems adjusting and is very upset that his dog cannot be brought back to life.

Situation II

Cindy's best friend moved to a town 25 miles away. She misses her friend and fears she'll never see her again.

Situation III

Susan tried out for cheerleader and didn't make the squad. She feels the try-outs were "rigged" and that she did not have a fair chance.

7. How should you handle Situation I:

    A. allow the child to bring a picture of the pet to the center and talk about it
    B. go buy Bobby a new dog
    C. have the day care center director handle the problem
    D. ignore the child, he will soon forget

8. How should you handle Situation II:

    A. help Cindy write her friend a letter or draw pictures
    B. ignore Cindy, she will forget
    C. let the director and parents handle the problem
    D. tell Cindy she will be okay

9. How should you handle Situation III:

    A. allow Susan to pout and ignore her
    B. allow Susan to teach the other children the cheerleading skills
    C. tell Susan she is acting ugly about the situation
    D. tell Susan she just was not good enough

07/09/86

CHILD CARE SAMPLE SCENARIO TEST
CHILD CARE TEACHER

1.	C	C0201
2.	B	C0202
3.	C	C0203
4.	C	D0301
5.	D	D0302
6.	C	D0303
7.	A	H0401
8.	A	H0402
9.	B	H0403

THE HANDS-ON COMPONENT

The hands-on component is the most complete measurement of a student's ability to perform a task. These test items are occupationally specific in that they require the student to carry out all necessary steps within an assigned task, just as they will be expected to in the work place.

Each hands-on component specifies the job objectives and a predetermined time standard.

Hands-on components consist of three major parts. These parts and their purposes are identified below:

I. EVALUATION FACTORS:
Evaluation factors specify the accepted standards of quality for the finished product. These criteria should be used by the instructor in evaluating the student's performance.

II. ADMINISTRATIVE COMMENTS:
Administrative comments provide the instructor and student with details concerning the testing situation, safety precautions, etc.

III. EQUIPMENT/TOOLS AND SUPPLIES LISTS:
Equipment/tools and supplies lists provide complete details of those items needed to complete the job.

When applicable, the hands-on component includes attachments that will be used for completion of the job by the student or grading of the job by the instructor.

For a specific duty/task breakdown of hands-on components available in the Occupational Food Service test battery, refer to the Duty/Task Plan in this booklet. Each of these test items is included in this section for your use.

JOB: SET COMPLETE MEAL COVER

The student will properly set linen, flatware, dinnerware, glassware, centerpiece, and accompaniments for a dinner for four. This job should be completed within 15 minutes.

The Student Will Be Evaluated On The Ability To:

1. Properly load and utilize cart	YES	NO
2. Properly set linen	YES	NO
3. Properly set dinnerware	YES	NO
4. Properly set flatware	YES	NO
5. Properly set glassware	YES	NO
6. Properly set centerpiece and accompaniments	YES	NO

Administrative Comments:

1. The instructor will be responsible for providing necessary equipment, tools, and supplies at the student's work station. The instructor will also inform students of any condiments needed.
2. The table will be set for four dinner guests.
3. The completed table setting will be evaluated according to the attached diagram. The student will not refer to the diagram during the job.
4. The student will practice safety procedures at all times or this job will be halted.

The Student Will Need:

Equipment/Tools

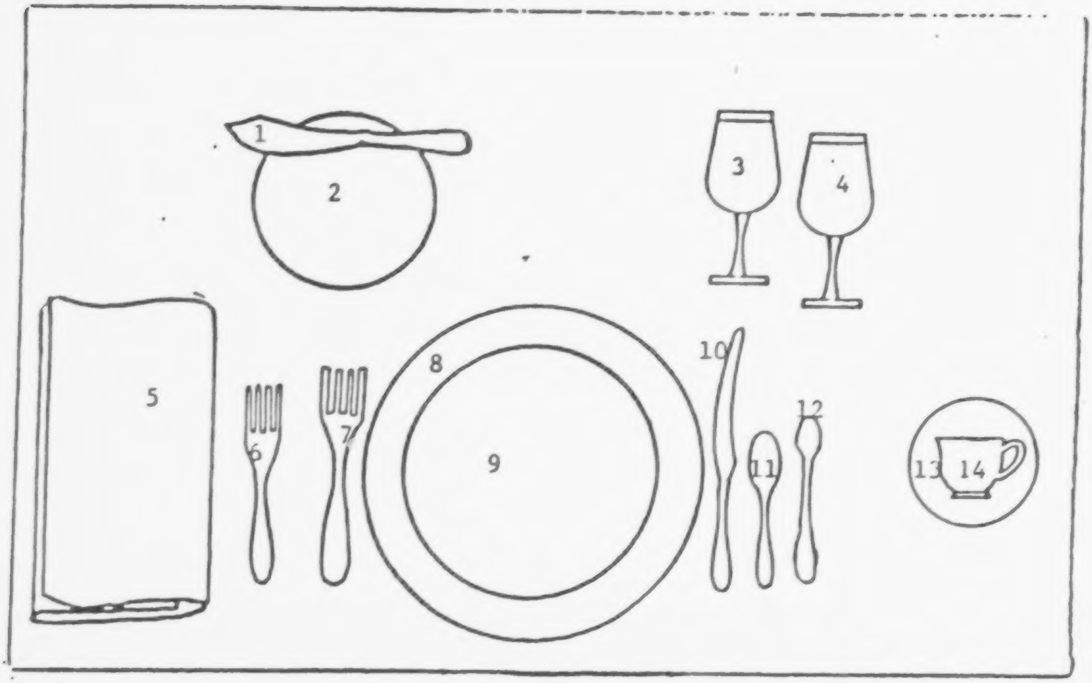
*Cart
*Table (approx. 12-16 sq. ft.)
*Chairs (4)
*Flatware (4 complete sets including butter knives, salad forks, dinner forks, dinner knives, dinner spoons, and iced tea spoons)
*Dinnerware (4 complete sets including dinner plates, underliners, butter plates, cups, and saucers)
*Glassware (4 complete sets including water glasses and iced tea glasses)

Supplies

*Cloth Tablecloth (to fit table)
*Cloth Napkins (4)
*Centerpiece
*Salt and Pepper Shakers
*Condiments (as needed)

JOB: SET COMPLETE MEAL COVER

E.04



1	Butter Knife
2	Bread/Butter Plate
3	Water Glass
4	Iced Tea Glass
5	Napkin
6	Salad Fork
7	Dinner Fork
8	Underliner
9	Dinner or Salad Plate
10	Dinner Knife
11	Dinner Spoon
12	Iced Tea Spoon
13	Saucer
14	Cup

TEST REQUEST

1) Instructor: ______________________________

School: ______________________________

Address: ______________________________

____

Phone #: ______________________________

2) Occupation to be Tested: ______________________
*Refer to occupation list

3) Type of Test Items: ______________________
*Cognitive, Scenario, or Hands-On Components

4) Number of Test Items: ______________________
*Specify number between 1 and 200

5) Instruction Option: ______________________

6) Date Needed: ______________________

7) Number of Computer Scoring Forms: ______________
(one per student per test)

Mail Request To:

______________, Testing Specialist
State Dept. of Vo-Tech
1500 West Seventh
Stillwater, Oklahoma 74074
(405) 377-2000

ASSIGNING CODES TO ITEMS

Each item in a test battery has a distinct code assigned. The code numbers are placed on the item worksheet in between the writer information and the resource information. The sequence is entered into the computer as follows:

```
**D;T#;I#;BAT;B;GL;F;K;Y
```

** = These two asterisks are necessary divisions because they allow the computer to recognize the entry as a separate item.

D = Duty, this is assigned from the test plan by the writer. It covers a major function performed regularly in an occupation (a single letter).

T# = Task number, assigned by writer from the test plan. It covers a single element of work (a two digit number).

I# = Item number, each set of items within a task are numbered and this then becomes the item number (a two digit number).

BAT = Title of battery, this denotes an occupational field and is assigned by the testing specialist. This matches with the test plan. To assign new battery code letters abbreviate the title by using the first letters of primary words in a three or more word title, the first three letters of one word titles or the first two letters of the first word and the first letter of second word in two titles, unless duplication occurs (three letters).

B = Basic skill area, this reflects the use of basic learning skills needed to answer the item (one letter).

M = math
S = science
H = humanities, includes social sciences
L = language arts, includes communications
X = no specific skill identified
Y = safety and health
C = computer skills

GL = Graphic lines, number of lines needed to accomodate drawings or other illustrations. Measure art work so that 1 inch = 6 lines add 1 plus the number of lines needed for preceding reference statement (two digit number).

F = Format, denotes type of item written and is assigned by the testing specialist during initial editing (one digit number).

1 = cognitive
2 = scenario
3 = hands-on components

K = Key, indicates the letter of the correct answer and is assigned after the distracters and the key have been alphabetized (one letter A-D).

Y = Year, the year the item is written for entry into the system (one digit number).

PERFORMANCE BASED TEST DEVELOPMENT SYSTEM

I. SELECTION PROCESS FOR TEST DEVELOPMENT

A. Testing Unit reviews Occupational Division's priorities for future support material development.

B. Occupational Division priorities are compared to summaries of secondary and Adult Program enrollment to determine areas of greatest need.

C. Curriculum and Testing priorities are then established through a negotiation process between Assistant State Directors and appropriate Unit heads.

D. Approximately two new program areas are selected for coming fiscal year development by each Testing Specialist.

E. CIMC specialists responsible for chosen occupational test developments are contacted and status reports on their efforts in these areas are obtained. If CIMC development has begun:

  1. Materials are reviewed for coordination of duty/task analysis.

  2. Appropriate Specialists are invited to participate in the Test Plan Development.

F. By mid-February, requests are submitted to Research for duty and occupational lists.

II. TEST PLAN DEVELOPMENT

A. Research Unit supplies list of occupations and major duties based upon Oklahoma Survey of Industries.

B. Task analyses from other sources, curriculum, previously developed materials, and input from Occupational Supervisory Staff are cross-referenced with information from Research Unit to establish the initial list of occupations and task analysis.

C. Industry Representatives, Teachers, and appropriate Occupational Supervisory Staff are invited to attend the Test Writer's Workshop. This group:

  1. Reviews the list of occupations to determine the occupations for which students are being trained in vocational education programs and validate which occupations are found in industry thus indicating occupations for which vocational programs should realistically train.

2. Reviews the Duty and Task Analysis and revises as appropriate based upon knowledge of industry standards and the work that would be expected of an entry-level employee.

3. Matches the Duties and Tasks to the Specific Occupations.

4. Determines the number of Hands-On Component, Scenario, and Cognitive Items to be developed for each task based upon frequency task is performed and importance of task to the occupation.

5. Receives training in the writing of test items. Hands-On Component Test Items are the central focus of the development because they measure the actual performance of the task. Scenario Items are written questions that require the student to apply the knowledge base. Cognitive Items are four-choice multiple-choice questions which are performance based.

6. Contracts to develop test items at:

$15.00	Hands-On Component (Includes Equipment/Tools, Supplies, and Facility lists)
7.50	Scenario Set
2.50	Cognitive Item

(University credit is available)

III. DEVELOPMENT OF OCCUPATIONALLY SPECIFIC TESTS

A. Items received from writers are reviewed by a Testing Specialist. Items are:

  a. Approved and payment made, or

  b. Not accepted and returned to the writer for revisions

B. Approved items are edited as necessary by the Testing Specialist.

C. Information from the HOC Development Sheets is used to write the Hands-On Component Test Items in the proper format.

D. Items are coded and entered into the computer.

E. Equipment/Tool, Supply, and Facility Lists are taken from the HOC items.

  1. These lists are checked for consistency of terms, spelling and format.

2. Each piece of equipment, etc., is coded to the task for which it is used.

3. Equipment/Tool, Supply, and Facility Lists are entered into data files which allow us to pull lists for specific occupations.

F. Test writers are invited back as a Review Committee to revise and validate the test items and corresponding equipment/tool, supply, and facility lists.

G. Testing Specialists make the necessary revisions and prepare the test materials for Field Testing.

IV. FIELD TESTING

A. Occupational Supervisory Staff recommend teachers for Field Test Group.

B. Field Testers are in-serviced by the Testing Specialist. Hands-On Components are disseminated and Test Request Forms given to Field Testers so that occupational tests can be requested as needed.

C. Instructors return the completed Score Sheets from occupational tests.

D. Score Sheets are taken to the Bureau of Tests and Measurements (OSU) for scoring. These scores are maintained in data files on the main frame computer system.

E. Statistical analysis is performed by the Testing Specialist through the use of a program designed by the Systems Design and Computer Services Division of the SDVTE.

DRAFTING

OCCUPATIONAL LISTING

1. **General Drafting** (Core) (Duties A - N)
2. **Architectural Drafting** (Core plus Duty O)
3. **Electronic Drafting** (Core plus Duty P)
4. **Civil Drafting** (Core plus Duty Q)
5. **Structural Drafting** (Core plus Duty R)
6. **Mechanical Drafting** (Core plus Duty S)
7. **Process Pipe Drafting** (Core plus Duty T)
8. **Technical Illustrating** (Core plus Duty U)

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
A.0	RECOGNIZE THE FIELDS OF DRAFTING						
A.1	Identify different drafting fields			2		Jon Jones	
A.2	Use drafting media			5		Jon Jones	
A.3	Use common symbols and abbreviations			5		Jon Jones	
A.4	Draw the alphabet of lines		1	4		Jon Jones	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFI

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
B.0	USE AND MAINTAIN BASIC DRAFTING EQUIPMENT AND MACHINES						
B.1	Use drawing equipment (templates, leads, erasing)			7		Ron Davis	
B.2	Use inking equipment			3		Ron Davis	
B.3	Use scales (architect's, metric, civil and mechanical)		4	8		Ron Davis	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
C.0	DEMONSTRATE CORRECT LETTERING TECHNIQUES						
C.1	Demonstrate lettering styles			2		Ron Davis	
C.2	Demonstrate characteristics of good lettering			6		Ron Davis	
C.3	Perform freehand lettering		1	2		Ron Davis	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
D.0	CONSTRUCT ORTHOGRAPHIC VIEWS		2			Jon Jones	
D.1	Use the six principle views			10		Jon Jones	
D.2	Apply basic dimension techniques		2	20		Jon Jones	
D.3	Demonstrate methods of projection			4		Jon Jones	
D.4	Differentiate line precedence (priority)			4		Jon Jones	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
E.0	UTILIZE BASIC GEOMETRIC CONSTRUCTION						
E.1	Bisect lines, arcs, and angles		2	2		Buddy Smithson	
E.2	Construct angles		1	2		Buddy Smithson	
E.3	Construct perpendicular and parallel lines		1	2		Buddy Smithson	
E.4	Construct geometric shapes		1	15		Buddy Smithson	
E.5	Construct drawings of tangent lines and arcs		1	4		Buddy Smithson	
E.6	Construct drawings of ellipses		1	7		Buddy Smithson	
E.7	Construct involutes		1	4		Buddy Smithson	

TEST PLAN WORKSH[illegible]T

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
F.0	UTILIZE REPRODUCTION PROCESSES			2		Ron Davis	
F.1	Utilize reproduction media			5		Ron Davis	
F.2	Select correct reproduction speeds			2	1	Ron Davis	

TEST PLAN WORKSH T

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writers	Date
G.0	FREEHAND SKETCH ORTHOGRAPHIC AND PICTORIAL VIEWS						
G.1	Utilize sketching materials			2	1	Jon Jones	
G.2	Apply sketching techniques		1	2		Jon Jones	
G.3	Illustrate the types of sketching			5		Jon Jones	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
H.0	CONSTRUCT PICTORIAL DRAWINGS						
H.1	Construct axonometric drawings		1	6		Jon Jones	
H.2	Construct oblique drawings		1	4		Jon Jones	
H.3	Construct perspective drawings		1	4		Jon Jones	
H.4	Apply dimensioning techniques		1	2		Jon Jones	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
I.0	CONSTRUCT SECTIONAL DRAWINGS		1			Jon Jones	
I.1	Use sectional symbols			6		Jon Jones	
I.2	Draw types of sections			10		Jon Jones	
I.3	Apply dimensioning techniques		1			Jon Jones	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
J.0	CONSTRUCT AUXILARY VIEWS		1			Jon Jones	
J.1	Show auxilary methods			6		Jon Jones	
J.2	Apply dimensioning techniques		1	2		Jon Jones	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
K.0	CONSTRUCT INTERSECTIONS AND DEVELOPMENTS					Tom Triplett	
K.1	Construct intersections		2	5		Tom Triplett	
K.2	Construct developments		2	5	1	Tom Triplett	
K.3	Construct revolution drawings		1	2		Tom Triplett	
K.4	Construct sheet metal assembly draw		1	2		Tom Triplett	
K.5	Calculate bend allowance			2	1	Tom Triplett	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
L.0	CONSTRUCT DRAWINGS USING INKING TECHNIQUES						
L.1	Use inking equipment to construct drawings			4		Buddy Smithson	
L.2	Maintain inking equipment			2	1	Buddy Smithson	
L.3	Apply inking techniques		1	4		Buddy Smithson	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
M.0	SOLVE MATHEMATICAL PROBLEMS RELATED TO DRAFTING						
M.1	Use conversion tables			2		Jon Jones	
M.2	Calculate areas of objects			3		Jon Jones	
M.3	Calculate volumes			3		Jon Jones	
M.4	Calculate weights of objects			3		Jon Jones	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
N.0	APPLY PRINCIPLES OF BASIC CAD						
N.1	Operate a CAD system			4		Ron Davis	
N.2	Use CAD terminology			10		Ron Davis	
N.3	Construct a two-dimension drawing		1		1	Ron Davis	
N.4	Store and retrieve drawings		1	4		Ralph Hinman	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
0.0	APPLY PRINCIPLES OF ARCHITECTURAL DRAFTING						
0.1	Construct commercial preliminary presentation sketches, site layouts, elevations, and sections			5	1	Bruce Yancey	
0.2	Construct drawings of commercial wall and roof sections			5		Bruce Yancey	
0.3	Construct drawings of commercial stair details (steel and concrete)			5		Bruce Yancey	
0.4	Construct commercial shaft section drawings (elevator, ventilator, utility)			5		Bruce Yancey	
0.5	Construct commercial interior elevation drawings			5		Bruce Yancey	
0.6	Construct commercial electrical detail drawings			5		Bruce Yancey	
0.7	Sketch residential preliminary layouts			5	1	Bruce Yancey	
0.8	Construct plot plans			5	1	Bruce Yancey	
0.9	Design and construct residential floor plan		1	5		Bruce Yancey	
0.10	Dimension floor plans		1	5		Bruce Yancey	
0.11	Construct foundation/basement plans			5		Bruce Yancey	
0.12	Construct floor framing plans			5		Bruce Yancey	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
0.13	Construct typical wood frame wall section drawings		1	5		Bruce Yancey	
0.14	Construct architectural elevation drawings		1	5	1	Bruce Yancey	
0.15	Construct residential roof framing plans			5	1	Bruce Yancey	
0.16	Construct residential electrical plans		1	5		Bruce Yancey	
0.17	Calculate residential electrical load requirements			5	1	Bruce Yancey	
0.18	Construct architectural plumbing system plans			5	1	Bruce Yancey	
0.19	Construct heating, ventilation and air conditioning system drawings			5	1	Bruce Yancey	
0.20	Construct drawings of window and door details and sections			5	1	Bruce Yancey	
0.21	Prepare window, door, and finish schedules		1	5		Bruce Yancey	
0.22	Construct fireplace/chimney detail drawings			5	1	Bruce Yancey	
0.23	Construct drawings of cabinet details		1	5		Bruce Yancey	
0.24	Construct stair detail drawings		1	5		Bruce Yancey	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
P.0	APPLY PRINCIPLES OF ELECTRONIC DRAFTING						
P.1	Use electronic component symbols			10		Buddy Smithson	
P.2	Draw Integrated Circuits (IC)			4		Buddy Smithson	
P.3	Construct drawings of schematic diagrams		1	4		Buddy Smithson	
P.4	Construct PC Board Drawing		1	3		Buddy Smithson	
P.5	Calculate mathematical problems			4	2	Buddy Smithson	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
Q.0	APPLY PRINCIPLES OF CIVIL DRAFTING						
Q.1	Illustrate types of civil drawings			10	1	Tom Triplett	
Q.2	Utilize appropriate scales		1	4		Tom Triplett	
Q.3	Recognize legal land descriptions			6	1	Tom Triplett	
Q.4	Interpret field data for drawings			10	1	Tom Triplett	
Q.5	Utilize mapping procedures			6		Tom Triplett	
Q.6	Construct topographic maps		1	6		Tom Triplett	
Q.7	Construct transportation maps		1	8		Tom Triplett	
Q.8	Construct municipal maps		1	4	2	Tom Triplett	
Q.9	Use basic surveying instruments		2	10		Tom Triplett	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
R.0	APPLY PRINCIPLES OF STRUCTURAL DRAFTING						
R.1	Draw AISC structural shapes			10	1	Ralph Hinman	
R.2	Construct commercial roof plan drawings			6		Ralph Hinman	
R.3	Construct beam connections		1	6		Ralph Hinman	
R.4	Construct column connections		1	4		Ralph Hinman	
R.5	Construct drawings of reinforced concrete and steel		1	6	1	Ralph Hinman	
R.6	Calculate mathematical problems			10	1	Tom Triplett	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
S.0	APPLY PRINCIPLES OF MECHANICAL DRAFTING						
S.1	Use drafting references and vendor's product catalogs			2		Tom Triplett	
S.2	Specify strength of materials in drawings			6	1	Tom Triplett	
S.3	Specify engineering materials in drawings			3	1	Tom Triplett	
S.4	Demonstrate shop processes			6	1	Tom Triplett	
S.5	Use precision measuring instruments			6		Buddy Smithson	
S.6	Use and interpret engineering drawings (incl. revisions)		1	5		Jon Jones	
S.7	Specify and construct drawings of fasteners			20		Jon Jones	
S.8	Calculate tolerances, fits and ratios			10		Jon Jones	
S.9	Apply geometric dimensioning and tolerancing			7	1	Buddy Smithson	
S.10	Construct simple working assembly drawings		2	5		Jon Jones	
S.11	Construct spur, bevel, and worm gear drawings		2	3		Tom Triplett	
S.12	Construct cam drawings		1	6		Tom Triplett	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
S.13	Construct detailed, schematic and simplified thread drawings		1	5		Jon Jones	
S.14	Specify standard welding symbols in completing drawings			10	1	Tom Triplett	
S.15	Construct welding assembly drawings		1	2		Tom Triplett	
S.16	Construct casting drawings			7		Tom Triplett	
S.17	Construct forging drawings			7		Tom Triplett	
S.18	Construct spring drawings			2		Tom Triplett	
S.19	Construct mechanical working drawings		1	5	1	Tom Triplett	
S.20	Construct jig and fixture drawings			4	1	Ralph Hinman	
S.21	Construct tool and die drawings			2	1	Ralph Hinman	
S.22	Construct assembly drawings using bearings and seals		1	2		Ralph Hinman	
S.23	Construct mechanical power transmission drawings			2	1	Ralph Hinman	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
T.0	APPLY PRINCIPLES OF PROCESS PIPE DRAFTING						
T.1	Demonstrate techniques used in process pipe drafting			6	1	Ron Davis	
T.2	Construct a flow diagram drawing		1	10	1	Ron Davis	
T.3	Construct a plot plan and equipment layout drawing		1	8		Ron Davis	
T.4	Construct a manufacturer's equipment fabrication drawing		1	6	1	Ron Davis	
T.5	Construct valve drawings		2	8		Ron Davis	
T.6	Construct pipe and pipe component drawings		2	8		Ron Davis	
T.7	Construct a piping plan and elevation		1	6		Ron Davis	
T.8	Construct isometric piping drawings		2	8		Ron Davis	
T.9	Construct a special fabrication detail drawing		1	4		Ron Davis	
T.10	Calculate mathematical problems			6		Ron Davis	

TEST PLAN WORKSHEET

Program: Drafting

Test Battery Code: DFT

Code	Duty/Task	Criticality	Hands-on Components	Cognitive Items	Scenario Sets	Writer(s)	Date
U.0	APPLY PRINCIPLES OF TECHNICAL ILLUSTRATING						
U.1	Construct pictorial drawings		2	4	1	Bruce Yancey	
U.2	Construct perspective renderings		1	2	1	Bruce Yancey	
U.3	Construct drawings of presentation floor plans			4		Bruce Yancey	
U.4	Construct drawings of presentation elevation views		1	4		Bruce Yancey	
U.5	Render designs using art mediums		1	5	1	Bruce Yancey	
U.6	Illustrate landscape features		1	5		Bruce Yancey	
U.7	Perform shading techniques		1	7		Bruce Yancey	
U.8	Construct presentation models			5	1	Bruce Yancey	

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Pennsylvania Skills Certificate

Presented
by

Bill Reilly
Pennsylvania

Carousel Session

Commonwealth of Pennsylvania

Department of Education

Bureau of Vocational and Adult Education

Presents this

Pennsylvania Skills Certificate

To

in recognition of having demonstrated high achievement in the Pennsylvania Skills Test which measures knowledge and performance skills

for the vocational program area of

Awarded this day of

PSC

SAMPLE Only

24 Robert P Casey

Robert P. Casey, Governor

Thomas K. Gilhool 241

Secretary of Education

This Certifies that

____

has completed a NOCTI Student Occupational Competency Achievement Test in the field of____________________

and is awarded this

SOCAT Certificate

Sample

for participation in the SOCAT testing program conducted in accordance with the standards of NOCTI and____________________

awarded on this____________________day of______________19____.

____

____

Scott D Whitener

Dr. Scott D. Whitener, Executive Director
National Occupational Competency Testing Institute

Certificate Number

```
               STUDENT OCCUPATIONAL COMPETENCY ACHIEVEMENT TEST
                               Administered By
              National Occupational Competency Testing Institute
                                   09/24/87
______________________________________________________________________________
Student Name: BURTON RM                 School: Jefferson County DuBois AVTS
 Soc Sec Num: 187-54-4010                State: PA
 Grade Level: Secondary                   Test: GENERAL DRAFTING & DESIGN
*** NT indicates section NOT TAKEN ***
==============================================================================
COGNITIVE SKILLS___________________Student  Class  School  State  Nation
                          Sequences  55.0%  49.0%   49.0%  57.1%   56.5%
                          Analogies  55.0%  60.0%   60.0%  62.9%   64.6%
                             Memory  50.0%  43.0%   43.0%  50.4%   47.7%
                   Verbal Reasoning   0.0%   0.0%    0.0%  49.3%   50.0% NT
                              Total  40.0%   0.0%    0.0%  58.2%   57.3%
   S=Student Score    ....|....|....|....|....|....|....|....|....|.....100%
  x=68% of Class pop.     |    |    |    S    |    |    |    |    |
  x=68% of School pop.    |    |    |    S    |    |    |    |    |
  x=68% of State pop.     |    |    |    S   xxxxxxxxxxx|    |    |
  x=68% of Nation pop.....|....|....|....S..xxxxxxxxxxx.|....|....|.....
WRITTEN TEST_______________________Student  Class  School  State  Nation
                  Preparing to Draw  53.8%  52.3%   52.3%  60.6%   60.9%
 Demonstrating Basic Drawing Skills  53.6%  63.6%   63.6%  72.1%   71.8%
           Introduction to Drafting  62.5%  60.0%   60.0%  66.0%   66.1%
             Drafting With Machines  40.0%  52.0%   52.0%  60.8%   59.2%
                Mechanical Drafting  41.4%  41.4%   41.4%  45.9%   45.3%
             Architectural Drafting  40.0%  54.0%   54.0%  72.0%   70.0%
                   Systems Drafting  10.0%  32.0%   32.0%  38.8%   38.3%
      Calculations Used in Drafting  18.2%  21.8%   21.8%  33.5%   33.2%
                              Total  41.0%  46.2%   46.2%  53.4%   52.9%
   S=Student Score    ....|....|....|....|....|....|....|....|....|.....100%
  x=68% of Class pop.     |    |    |   xSxxxxx    |    |    |    |
  x=68% of School pop.    |    |    |   xSxxxxx    |    |    |    |
  x=68% of State pop.     |    |    |    Sxxxxxxxxxxx   |    |    |
  x=68% of Nation pop.....|....|....|....Sxxxxxxxxxxx...|....|....|.....
PERFORMANCE________________________Student  Class  School  State  Nation
                      Constructions   0.0%   0.0%    0.0%  85.6%   85.6% NT
                    Auxiliary Views   0.0%   0.0%    0.0%  80.0%   80.0% NT
                  Threaded Assembly   0.0%   0.0%    0.0%  81.1%   81.1% NT
                      Machined Part   0.0%   0.0%    0.0%  79.1%   79.1% NT
            Sheet Metal Development   0.0%   0.0%    0.0%  78.9%   78.9% NT
                    Section Drawing   0.0%   0.0%    0.0%  81.8%   81.8% NT
                         Floor Plan   0.0%   0.0%    0.0%  81.2%   81.2% NT
                              Total   0.0%   0.0%    0.0%  82.2%   82.2%
   S=Student Score    ....|....|....|....|....|....|....|....|....|.....100%
  x=68% of Class pop.     |    |    |    |    |    |    |    |    |
  x=68% of School pop.    |    |    |    |    |    |    |    |    |
  x=68% of State pop.     |    |    |    |    |    |    |xxxxxxxxxxx
  x=68% of Nation pop.....|....|....|....|....|....|....xxxxxxxxxxx.....
```

PENNSYLVANIA SKILLS CERTIFICATE

COORDINATOR'S

Activities

________ Attend the PSC Coordinators Training Session

________ Send to parents of senior vocational students the brochure on PSC.

________ Meet with vocational teachers, and counselors to discuss which test titles to administer and when.

________ Meet with vocational teacher to determine the titles and number of tests to order.

________ Meet with administration, teachers, and counselors to finalize testing schedule (March 1 through May 20).

________ Arrange for rooms, labs, shops, and/or other areas needed for testing.

________ Submit Order Form to NOCTI for tests, stating when you want the tests delivered.

________ With vocational teachers determine the number of Test Proctors and Test Evaluators needed for administering the tests.

________ Work with teachers to contact test proctors and test evaluators.

________ Sent to seniors and their parents a copy of the test schedule.

________ When test materials arrive by UPS from NOCTI, check to insure that all materials ordered have been received.

________ Meet with test proctors and conduct training sessions.

________ Meet with test evaluators and conduct training session.

________ With teachers and test evaluators, check availability of supplies, materials, and equipment needed to administer tests. Order necessary items.

FEBRUARY

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29					

MARCH

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

APRIL

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

MAY

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

JUNE

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

_______ Check out test materials to test proctors.

_______ Be available to assist test proctors during the administering of the Aptitude and/or Written test.

_______ Check in test materials from test proctors.

_______ Check out test materials to test evaluators.

_______ Be available to assist test evaluators during the administering of the Performance test.

_______ Check in test materials from test evaluators.

_______ Re-pack all test materials and ship by UPS to NOCTI.

_______ Check test results when they arrive from NOCTI.

_______ Check PDE's "Pennsylvania Skills Certificate" for authorized students.

_______ Present NOCTI certificates to all students that took tests.

_______ Present PDE's "PSC" to authorized students.

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Florida's Testing Program

*Presented
by*

Warren Harrell
Florida

Carousel Session

FLORIDA'S TESTING PROGRAM

Given that the major objective of a student achievement testing program is to improve the quality of instruction and enhance learning, a critical issue becomes the necessity to be able to access readily available, content valid and acceptably performing test items; coded with appropriate attributes, blueprinted commensurate with current curriculum frameworks; and, available in an automated format. Further, the teachers must "buy" ownership in the system. These issues have emerged as the critical initiatives in developing the Florida Achievement Testing Program.

The Florida legislative mandates relative to student achievement is to provide indicators of the performance of specific job preparatory programs at the state and planning region levels. This charge eliminates the need for norm referenced testing of students and strict security procedures. Consequently, the primary objective of the Florida Achievement Testing Program is to improve vocational instruction; and, may best be expressed by the following assumptions:

1. Testing is a valuable activity for assessing student progress and for improving vocational programs;

2. Vocational teachers and administrators have a need for quality test items and tests, but need help in developing them;

3. The Division of Vocational, Adult, and Community Education, (DVACE), Florida Department of Education can best assist local educational agencies by providing a centralized approach for developing written and performance test items; and,

4. Florida's approach to vocational testing will be consistent with individualized competency-based education.

The program improvement mode centers around criterion reference testing, or more specifically - How are we teaching each component of the curriculum? The logistic problem is lessened in that Florida has required Program Course Standards for all programs at both the secondary and postsecondary levels. These standards include a curriculum framework consisting of Intended Outcomes and Student Performance Standards supportive of each outcome. However, the system can not be productive unless it is diffused to teachers in such a manner that is accessible, usable, and perceived as valuable by them for improving the quality of instruction.

To realize the objective of improving vocational programs utilizing achievement testing, the following activities are being implemented:

A. Development Of Banks Of Valid Test Items. As a member of the V-TECS Consortium, Florida benefits from these efforts. The state effort includes a system of coding and blueprinting items to each program curriculum and appropriate activities to assure content validity and acceptable item performance. Item searches are made and when appropriate, new items are developed. This is an annual function of the Center for Instructional Development.

B. Implement A Branch Banking Capability For All LEAS. In the fall each LEA will be provided with banks for 25 programs. The individual diskettes will be in an ASCII format - or hard copy if requested. There are 10 sites that will be forerunners of this activity this spring. The Division of Vocational, Adult and Community Education is providing hardware for these sites and the DATABANK software developed by the Educational Clearing House. The objective is for every teacher in Florida to be able to access the following automated functions relative to the specific vocational program(s) for which they provide instruction:

- Apply blueprint for segment of curriculum to be tested;
- Randomly or manually generate tests;
- Score tests;
- Analyze and print test results of students;
- Analyze and print test results relative to student mastery of each intended outcome;
- Analyze item performance;
- Track records of individual students, including demographic information, for feedback and other instructional activities.

C. Teacher In-Service. The DVACE will provide staff development activities for LEAS to assist teachers in utilizing a test item bank in their instructional activities.

D. Annual Development, Updating, and Maintenance Conference. This Test strategy is designed to address the heart of the major issue. A one week working conference will be held each summer. This summer, 10 teams, consisting of 4 selected teachers plus a facilitator; supported by a conference leader and psychometrician, will address the banks of at least 15 programs that require new items, updated items, or new coding to accommodate curriculum changes. Further, on a year around basis services will be available to update banks when only a technical change is required in coding the items.

E. Statewide Program Achievement Testing. Each year the DVACE will develop and administer statewide tests for programs offered in Florida based on a three to five year cycle. This activity will provide the data for the statewide and regional indicators of the achievement of specific programs. This year the DVACE is piloting 10 tests (secondary and postsecondary adult) for 5,500 students in 41 LEAS. (36 Districts and 5 Community Colleges)

Concluding, Florida is attempting to develop a good product that is accessible and usable - and marketed in a manner that teachers can see the value, and consequently implement a comprehensive testing system as an ongoing accepted instructional practice for program improvement and increased student achievement.

Prepared By:
L. Warren Harrell, Ed.D.
Director, Evaluation Section
Division of Vocational, Adult
and Community Education
Florida Department of Education
FOR
The National Conference on Critical Issues
In
Competency-Based Testing For
Vocational-Technical Education
April 11-13, 1988
Nashville, Tennessee

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

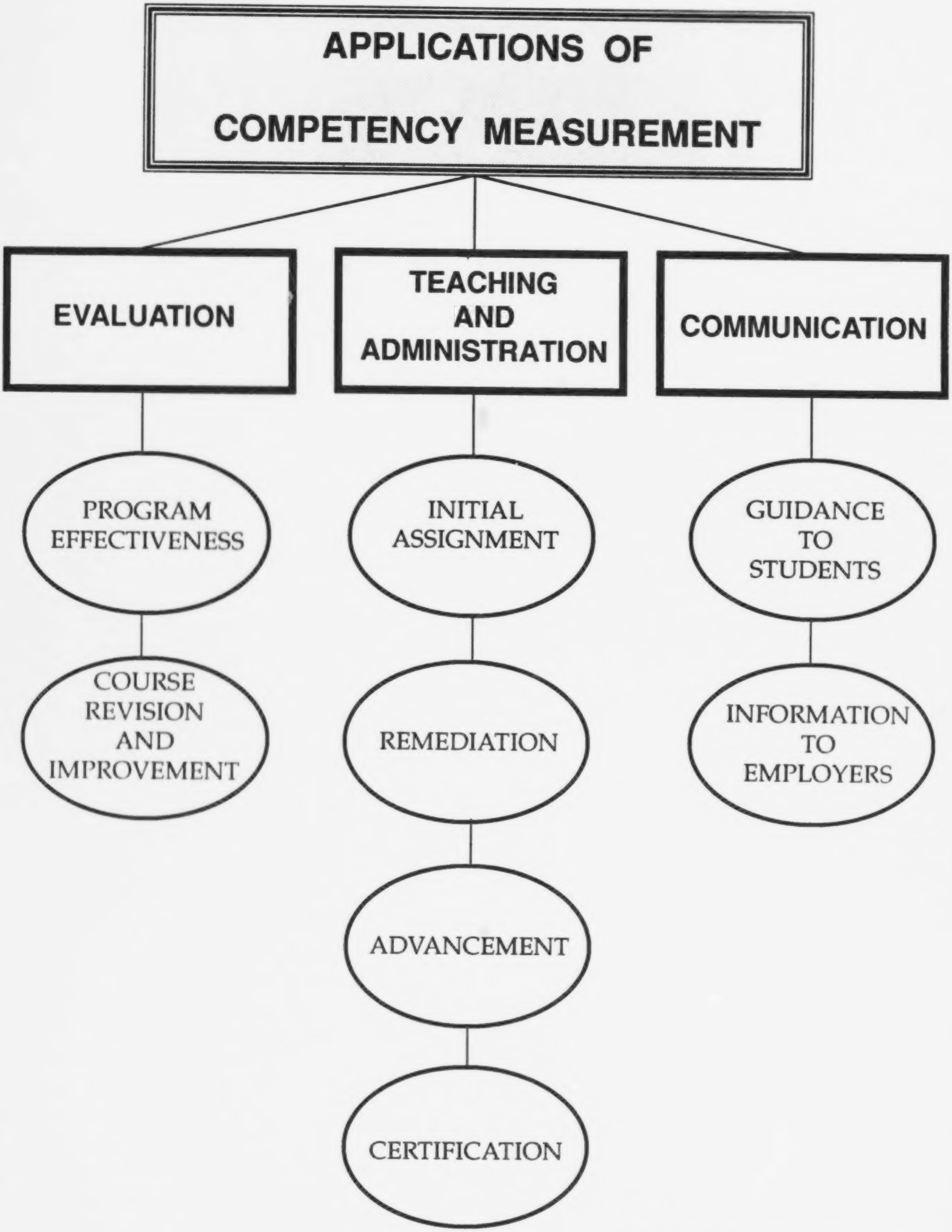
April 11-13, 1988

V-TECS Test Item Banks

*Presented
by*

Brenda Hattaway
and
Ron McCage

Carousel Session


APPLICATIONS OF COMPETENCY MEASUREMENT
EVALUATION
TEACHING AND ADMINISTRATION
COMMUNICATION
PROGRAM EFFECTIVENESS
COURSE REVISION AND IMPROVEMENT
INITIAL ASSIGNMENT
REMEDIATION
ADVANCEMENT
CERTIFICATION
GUIDANCE TO STUDENTS
INFORMATION TO EMPLOYERS

ITEM CODE LAYOUT

1. Code Layout

Field #	Length	Contents	Example
1	6	Catalog # - from the V-TECS product list	WV013C
2	2	State of origin of the item	GA
3	4	Date (MMYY) - date accepted by V-TECS as a V-TECS item bank	0186
4	2	Item type MC = Multiple Choice P = Performance MA = Matching O = Other	MC
5	2	Duty Area -- as assigned in the referenced task list	B
6	3	Task Number -- tasks within duty areas should begin with 001 and continue in sequence throughout an entire duty area. Start each new duty with task number 001.	003
7	2	Learning Domain C1 = Cognitive Knowledge Recall C2 = Cognitive Knowledge Application P1 = Performance Process P2 = Performance Product Quality P3 = Both Performance/Product	C1
8	1	Specify the number of graphics for the item (0 = no graphic, 1 = one graphic, 2 = two graphics, etc.)	0
9	1	Letter of correct answer for multiple choice items	C
10	6	Unique item number within state of origin	000001

2. Multiple Choice Item Example:

`*|WV013C|GA|0186|MC|B |003|C1|0|C|000001`

The first check for problems in the distributor is usually performed with a:

a. timing light.
b. tack and dwell meter.
c. voltmeter.
d. feeler gauge.

Test Assembly Checklist

Put a check in the blank to the right of each statement after you've checked to see that it applies to your test.

	Yes	No
1. Are items of similar format grouped together?	____	____
2. Are items arranged from easy-to-hard levels of difficulty?	____	____
3. Are items properly spaced?	____	____
4. Are items and options on the same page?	____	____
5. Are diagrams and supporting material above designated items, and on the same page with items?	____	____
6. Are answers random?	____	____
7. Is an answer sheet enclosed in the test packet?	____	____
8. Are blanks for name and date included?	____	____
9. Have the directions been checked for clarity?	____	____
10. Has the test been proofread for errors?	____	____
11. Do items avoid racial or sexual bias?	____	____

Quantitative Item Analysis Checklist

1. Item Number ________

2. Difficulty level: $p = \dfrac{\text{No. correct}}{\text{total}}$ ________

3. Discrimination index:

$$D = \frac{\text{Number correct (upper) - Number correct (lower)}}{\text{Number of students in either group}}$$ ________

4. Eliminate or revise item?

Check the item discrimination index---

Does the item discriminate positively?

If you answer yes, no revision may be necessary.
If you answer no, revise or eliminate the item.

Check for miskeying, ambiguity, or guessing---

a. miskeying (more chose distractor than key).
b. guessing (equal spread of choices across options).
c. ambiguity (equal number chose one distractor and the key

NATIONAL CONFERENCE ON CRITICAL ISSUES
IN
COMPETENCY-BASED TESTING
FOR
VOCATIONAL-TECHNICAL EDUCATION

April 11-13, 1988

Constructing a Competency-Based Test

Presented
by

John Horton
Kentucky

Tuesday, April 12
2:00 pm - 3:00 pm
3:30 pm - 4:30 pm

Wednesday, April 13
8:30 am - 9:30 am

CRITICAL ISSUES IN COMPETENCY BASED TESTING
NASHVILLE, TENNESSEE
APRIL, 1988

Constructing A Competency Based Test

The objective of this presentation is to describe how to construct a competency based test including writing test items, assigning criticality of duty areas, and actually putting the test together. Competency Based tests must measure the student's knowledge of and/or the ability to safely perform specific occupational tasks. In order to construct a test you must start with the construction of test items.

The construction of two kinds of test items will be addressed.

1. Cognitive (Know) Test Items: Test items which are designed to measure students' knowledge of performing a specific task.
2. Psychomotor (Do) Test Items: Test items which are designed to measure students' ability (skill) to safely perform specific tasks.

Writing valid and technically accurate test items is not a difficult task when the following criteria is followed.

- Each test item should relate to a critical "KNOW" or "DO" skill in the task analysis.
- The test item should measure the students' knowledge of or their ability to safely perform a specific task.
- Test items should be technically accurate.
- Test items should not be designed to measure "trivia."
- A sufficient number of test items should be written to adequately measure the students' knowledge of and their ability to perform the task.
- Each test item should be constructed so that there is one, and only one, interpretation of the item.

CONSTRUCTING COGNITIVE (KNOWLEDGE) TEST ITEMS

Test items which measure the students' knowledge of performing specific occupational skills are referred to as cognitive (knowledge) test items. These items are designed to measure the students' ability to recall specific information that is related to performing a task.

These knowledge test items include the recall of:

* Names and labels
* Facts
* Terminology
* Definitions
* Procedures and methods
* Stated rules

Test items in this first category are referred to as C-1 or Cognitive Level 1 items.

Test items that measure the students' ability to apply knowledge that is related to performing a specific task are also cognitive. These applications of knowledge test items include:

* Using formulas
* Interpreting charts, graphs and diagrams
* Classifying (objectives, concepts)
* Selecting appropriate rules to solve problems
* Applying rules to specific situations or conditions
* Solving "hands-on" problems (diagnosing, troubleshooting, debugging)
* Analyzing (comparing, contracting, distinguishing)
* Evaluating (judging, assessing)
* Synthesizing (designing, planning, organizing)

Test Items in this second category are referred to as C-2 or Cognitive Level 2 Items.

C-1 Level Test Items. When the task analysis indicates that the students' recall of a critical cognitive (know) skill should be tested, a cognitive C-1 Level test item is constructed.

Below are examples of C-1 Level test items.

* Task: Key from rough-draft copy.

Know Skill: Proofreading techniques

C-1 Level Test Item:

1. Proofread copy the first time:

    a. Just before sending it in the mail

    [✓ **b.] While it is still in the machine or on the display screen.

    c. Immediately after it is removed from the machine or played back on the display station.

    d. When a co-worker is available to proofread along with you.

* Task: Replace a defective switch.

Know Skill: Operation of Ohmmeter

C-1 Level Test Item:

The first step in using a Ohmmeter is to:

a. Calibrate the meter.

[✓ b.] Select the scale.

c. Connect the leads.

d. Disconnect the leads.

**The circle represents the correct answer.

C-2 Level Test Items. When the task analysis indicates that the students' ability to apply knowledge should be tested, a cognitive C-2 Level test item should be constructed.

Below are examples of C-2 Level test items:

* Task: Key from rough-draft copy:

Know Skill: Proofreader's symbols

C-2 Level Test Item:

in long hand lc lc

1. ~~Keyed~~ copy that has been corrected ^ is known as Rough Draft.

The sentence above has been edited. Which sentence below reflects the corrections indicated by the proofreader's symbols?

a. Keyed copy that has been corrected in long hand is known as rough draft.

b. Keyed copy that has been corrected in longhand is known as rough draft.

[✓ c.] Copy that has been corrected in longhand is known as rough draft.

d. Copy that has been corrected in long hand is known as rough draft.

* Task: Replace a defective switch.

Know Skill: Operation of Ohmmeter

C-2 Level Test Item:

1. To determine that there is continuity across terminals the Ohmmeter reading should be:

   a. Infinity

   b. 1000 Ohms

   c. 100 Ohms

   [✓ d.] 0 Ohms

CONSTRUCTING MULTIPLE CHOICE TEST ITEMS. Only multiple choice written response test items will be discussed here.

Non-Graphic Format. The following guidelines are helpful when constructing multiple choice test items:

- Present one and only one concept in the stem.

  (C-1) 1. Wires are color coded in order to:

  a. Indicate the gauge of the wire.
  b. Identify the circuit.
  c. Indicate the maximum allowable current.
  d. Identify the number of wires.

- Keep the stem positive unless an exception is to be emphasized. If an exception is emphasized, it should be underlined or capitalized.
- Select and include distractors which are grammatically consistent with the stem and with each other.
- Write test items which have one best answer.
- Avoid verbal association between the stem and the correct response.
- Include at least four distractors.
- Use plausible distractors.
- Position the distractors in a logical order; i.e.,

  --Numerical sequence

  --Alphabetical sequence

- Avoid unintentional clues to the correct answer; i.e.,

  ..Correct response is longer than other responses.

- Avoid using the options "all of the above" and "none of the above."
- Vary the position of the correct response by using a random location within the distractors.

- * Avoid using a series of true-false statements as a multiple choice item.
- * Include enough test items to adequately sample the skill.
- * Construct test items that are independent of other test item answers.

Below are examples of multiple choice test items:

(C-1) 1. Proofread copy the first time:

   a. Just before sending it in the mail.

   b. While it is still in the machine or on the display screen.

   c. Immediately after it is removed from the machine or played back on the display screen.

   d. When a co-worker is available to proofread along with you.

(C-2) 2. Before checking the continuity of a circuit, the most important step should be to:

   a. Hook up Ohmmeter leads.

   b. Take a reading.

   c. Disconnect the power to the circuit.

   d. Close the switch.

Graphic Format. These test items use line drawings, a picture, a photograph or other presentation using pictorial or symbolic rather than verbal formats.

A graphic multiple-choice test item may be appropriate when it will present information better than words. For example:

- * The students' knowledge of specific parts of a product should be tested.
- * The students' recall responses of tools, equipment, or materials needed for performing a task should be tested.

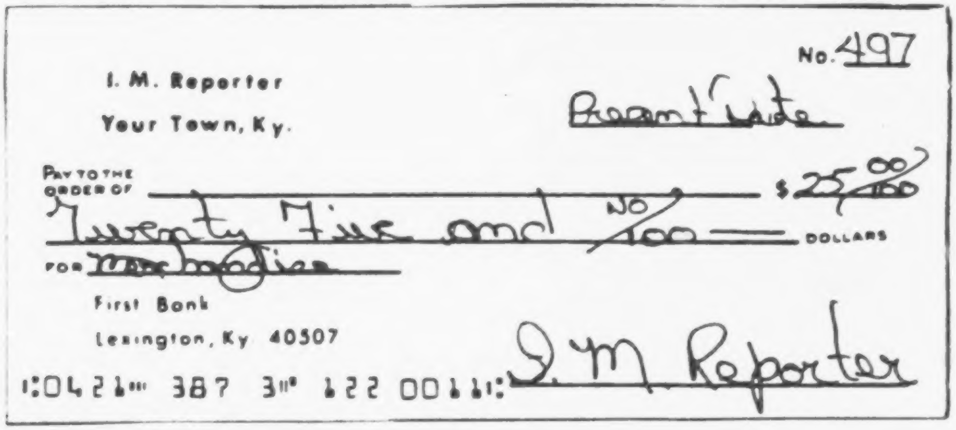
- The students' ability to select the correct tool for performing a specific task should be measured.
- The students' ability to identify the operation of tools and equipment, such as read meters.
- The students' ability to select correct operations in performing a task should be assessed.
- The students' ability to identify a step in an operation needs to be measured.
- The students' ability to recognize defective or damaged parts needs to be measured.
- The students' ability to recognize incorrect assembly of a specific part or assembly needs to be tested.
- The students' ability to identify the function of a part needs to be tested.

These are only a few of the reasons for constructing graphic test items.

In summary, graphics can be used when "a picture is better than a thousand words."

Here is an example of a graphic test item.

1. The check shown below is presented by a customer to pay for purchased merchandise. Should the check be accepted by the salesclerk?



No. 497

I. M. Reporter
Your Town, Ky.

Present Date

PAY TO THE ORDER OF ______________________ $ 25 00/100

Twenty Five and NO/100 —— DOLLARS

FOR Merchandise

First Bank
Lexington, Ky 40507

:0421" 387 3" 122 0011: I. M. Reporter

A. Yes, it is ok.

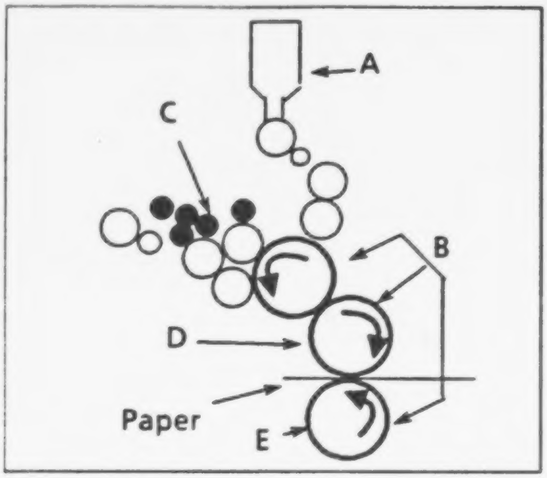
B. No, the signature is not proper.

C. No, the amounts do not match.

D. No, the payee is not filled in.

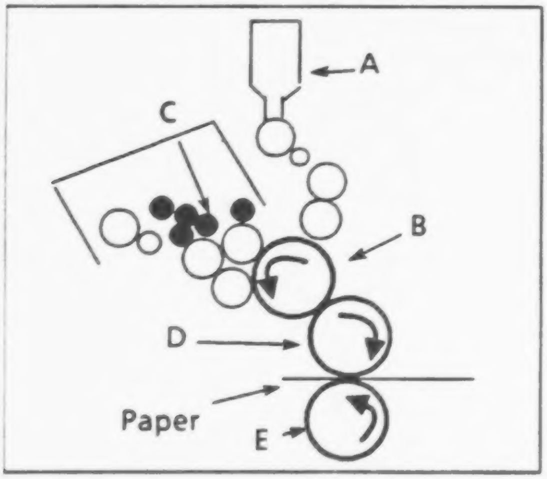
SAMPLE

106. Look at the diagram below and identify part B.



A. Feed system
B. Delivery system
C. Ink system
D. Cylinder system

107. Look at the diagram below and identify part C.



A. Ink system
B. Cylinder system
C. Feed system
D. Delivery system

GUIDELINES FOR WRITING PSYCHOMOTOR (DO) TEST ITEMS

After test items for critical "KNOW" skills have been constructed, the ''DO" skills can be used to write performance items.

A minimum of one performance item may be written for each psychomotor "DO" task that requires action. Several performance items can be prepared that represent comprehensive demonstrations of performances that cover two or more tasks, an entire duty area, two or more duty areas, or an entire job title. The number of comprehensive performance items should be determined by the test item writer(s) with advice from incumbent and subject matter experts.

Performance/hands-on items should be written so that they can be evaluated in one of the following ways:

(1) Checklists.

(2) Rating sheet.

(3) Other means that review the product (outcomes) or the process used to produce the project (outcomes).

Final Product Checklist. When a psychomotor task involves the evaluation of a product (not the process), a checklist may be developed.

Here is an example of a final product checklist:

* Task: Key from rough-draft copy.

Product Checklist:

The final keyed copy:

	Yes	No
a. Is neat.	☐	☐
b. Includes the same information as contained in the rough draft.	☐	☐
c. Reflects all corrections indicated	☐	☐
d. Is free of spelling, punctuation, and grammatical errors	☐	☐

NOTE: The above items are taken from the standard of the performance objective.

For checklists designed to assess performance of a task that results in a tangible product, the following criteria is relevant:

The checklist items are based on the way the product is supposed to look, operate, and be repaired on the job.

The parts of the product are organized and described briefly and clearly.

The checklist criteria are organized in a way that facilitates their assessment.

Any two qualified raters using the checklist should be able to evaluate the same product in the same way or in nearly the same way.

Performance Checklist. Performance skills are measured by observing student performance and evaluating it with a checklist on the basis of stated criteria of acceptability. The format for psychomotor tasks would usually include a statement of the task or skill to be performed, and the criteria for evaluating the performance.

The test item also needs to include directions to the student; a list of equipment needed for the performance; and the directions to the teacher/evaluator.

The checklist should specify whether all the criteria on the checklist are necessary for the student to pass the objective, or whether there are certain critical items on the checklist; if so, these should be identified.

* You may follow these procedures when writing performance test items.

1. Write a description of the skill that is to be performed.
2. Write directions to students in language that will be understood by them.
3. If a case situation is needed, write it.
4. List the tools, materials, and equipment that will be needed to perform the test.
5. Include all safety procedures and note special precautions.
6. Write directions for the examiner. Include safety precautions.
7. If time is a critical standard include the estimated time that should be allowed for performing the test item.
8. Construct a performance checklist that can be used for evaluating the students' performance.

An example of a performance checklist is on the following pages.

PERFORMANCE/PROCESS TEST ITEM

The following is a performance test item: Instructions to the student and the examiner are included. This page precedes the actual checklist.

* Task: Replace a Defective Switch.

Instruction to Examiner:

Indicate on the accompanying checklist whether or not each step was performed by the student.

Instructions to Student:

You will be given a circuit that has a defective switch and a new switch to install. Check the circuit and replace the defective switch.

Tools and Equipment:

Ohmmeter, flat head screw driver, open end wrench, new switch.

Estimated Time: Not applicable

* If student does not disconnect the power source this test should be stopped immediately.

TEST ITEM CHECKLIST FOR PERFORMANCE EVALUATION

When replacing the defective switch, the student:

		Yes	No
a.	Disconnected the power source. (This step must first be performed by the student. If it is not performed, the student must be told immediately to stop the test		
b.	Selected the correct Ohmmeter scale.	( )	( )
c.	Calibrated the Ohmmeter.	( )	( )
d.	Took a reading across the switch terminals with the Ohmmeter with switch in both the on and off position	( )	( )
e.	Removed the fasteners holding the switch	( )	( )
f.	Disconnected the wires	( )	( )
g.	Fastened the wires to the new switch observing the color code	( )	( )
h.	Replaced the fasteners that hold the switch	( )	( )
i.	Reconnected the power to the circuit	( )	( )
j.	Tested the switch by turning it on and off	( )	( )

For tests designed to assess performance of a task that does not result in a tangible product (process), the following questions are relevant:

The checklist should include all safety procedures.

- * The checklist standards should be based on the requirements of performing the task on the job.
- * The checklist should include all important steps.
- * The steps should be stated briefly and clearly.
- * The steps should be sequenced in an acceptable order of performance.
- * Any two qualified raters using the checklist should be able to evaluate the same performance in the same way or in nearly the same way.

Performance/Product Checklist. Some tasks require that both process and product be evaluated. This is particularly true when safety is involved. When both process and performance need to be measured, both a performance evaluation form and a product evaluation form should be completed.

Following is an example of performance and product test item.

Operating Gas Welding Equipment

Job 1: Oxyacetylene Welding, Butt Joint, Flat Position

Estimated Time: 15 minutes

Instructions to Student:

1. You will be given 2 pieces of 3" x 8" x 16-gauge mild steel. Make a butt joint with 1/16" root opening, flat position.
2. You will completely weld the joint on one side.
3. You will notify the examiner when you have finished so that your work may be inspected.

Tools and Equipment: Oxyacetylene welding torch, hoses, gauges, two practice plates, welding rod

Instructions to examiner:

1. The maximum time for this test is four hours. In addition, each task has a time limit, from 10 to 70 minutes, printed at the top of the task.
2. If the student has not completed the task in the allotted time, the students should be told to clean up the testing area and return to the staging area for assignment to another task. Steps the student did not complete should be marked "NO" and a comment to that effect written.
3. Students completing the task in the allotted time should return the testing area to its pre-test condition and then return to the staging area for assignment to another task.
4. The examiner should make all ratings on individual student "Performance Evaluation Checksheets" as the work progresses. Rating information should not be shared with the student. Upon completion of the task, each students's Guidesheets should be returned to the student's folder.
5. The examiner should complete a Product Evaluation form when the task is finished.

TEST ITEM CHECKLIST FOR PERFORMANCE EVALUATION

When operating gas welding equipment, the student:

		Yes	No
a.	Gas Welded Low and Medium Carbon Steels	( )	( )
b.	Selected proper tools and equipment	( )	( )
c.	Properly adjusted equipment	( )	( )
d.	Properly set-up mental	( )	( )
e.	Used proper techniques	( )	( )
f.	Practiced all safety requirements	( )	( )

TEST ITEM CHECKLIST FOR PRODUCT EVALUATION

The student's welded butt joint shows:

a.	Butt Joint to Standards	( )	( )
b.	Proper width of bead	( )	( )
c.	No Undercut	( )	( )
d.	Proper reinforcement	( )	( )
e.	Proper penetration	( )	( )
f.	Good ripple	( )	( )
g.	Uniformity	( )	( )

Tips for Writing Performance Test Items

Thoroughly:

* Examine the task analysis "DO" skills to determine what tasks would best be tested with performance test items.

* Determine if tools, materials, space and time restraints permit the performance test to be conducted.

* Prepare specific student directions for taking the performance test.

* Prepare directions for the examiner.

* Prepare a checklist for evaluating the students' performance. The checklist should be:

  --Free of subjective evaluation.

  --Designed to measure: (1) the students' ability to perform a process, (2) the quality of a produced product, (3) both the process and product.

Duty Area Criticality

The task list is the basis or foundation for developing test items. In order to insure that the test accurately measures the program, the task list must be broken into duty areas and each duty area must be assigned a criticality factor. This should be stated as a percentage.

To assign criticality factors to duty areas, two things must be considered. (1) The amount of teaching time the duty area represents and (2) How critical the duty area is in relation to the entire program. In other words, the duty area may represent 10% of the total teaching time, but because of the critical nature of the duty area, a 15% criticality factor may be assigned. All criticality factors must total 100%.

After duty area criticality is assigned, the number of test questions must be selected. This process should consider time allowed for the test, adequate number of questions to effectively measure student achievement, machine scoring capabilities, etc. With the total number of questions selected, multiply by the percentage to get the number of questions for each duty area. This will insure that the test properly emphasizes and measures each duty area.

DUTY AREA C: CARE OF THE SURGICAL PATIENT 18% 36 Test items

SUT-027. Identify the safety precautions used in operating room activities

SUT-028. Measure body temperature

SUT-029. Check pulse and respiration rates

SUT-030. Take a blood pressure reading

SUT-031. Record vital signs

SUT-032. Demonstrate correct body mechanics

SUT-033. Transport the surgical patient

SUT-034. Position the surgical patient

SUT-035. Identify the health care team

SUT-069. Identify preoperative skin prep areas

SUT-070. Perform a preoperative shave

SUT-071. Perform a catheterization

SUT-072. Perform a surgical cleansing skin prep

SUT-073. Drape the patient

SUT-084. Describe the principles of electrosurgery

SUT-085. Describe treatment of an electrical shock in the operating room

SUT-087. Care for surgical specimens

SUT-088. Perform duties of the circulator and scrub specialist in a surgical procedure

SUT-090. Identify ethical, legal, and moral obligations

DUTY AREA D: SUPPLIES AND EQUIPMENT 12% 24 Test items

SUT-036. Identify areas of the operating room suite

SUT-037. Identify features and functions of operating room furniture and equipment

SUT-038. Identify the names and uses of basic surgical instruments

SUT-039. Identify surgical supply items

SUT-064. Open sterile supplies

SUT-074. Identify common types of suture materials

SUT-075. Identify common types of surgical needles

SUT-076. Prepare sutures

EVALUATION OF GOOD TESTS AND TEST ITEMS

A good test item is:

* Valid: It measures what it is designed to measure and nothing else.

* Reliable: It measures accurately and consistently. It is designed so that the student has difficulty guessing the correct response.

Can be objectively scored: The examiner's opinion, bias, and individual judgement is eliminated.

A complete test is:

* Comprehensive: When collectively assembled, the test items must liberally sample all phases of instructions within the program area. It is not necessary nor practical to test every point that is taught in a program; but a sufficient number of test items should be included to provide a valid measure of student competency in the completed program.

* Can be readily administered and scored.